Heating Piping & Air Conditioning

JULY 1956

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INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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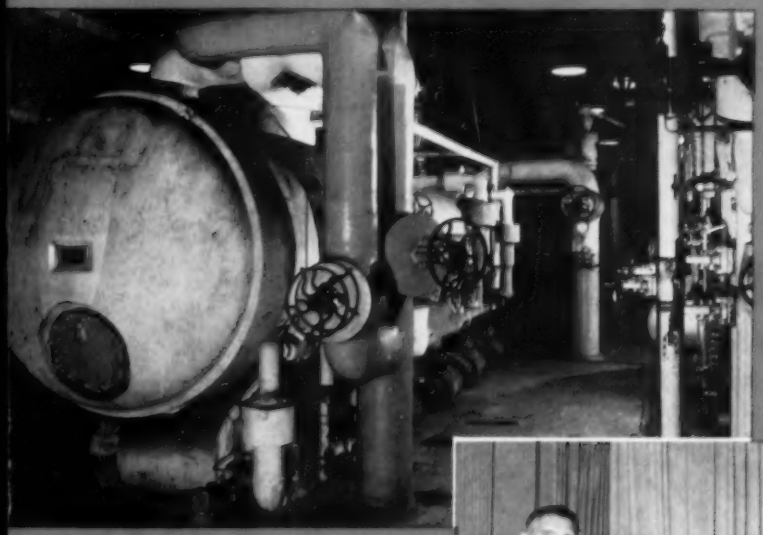

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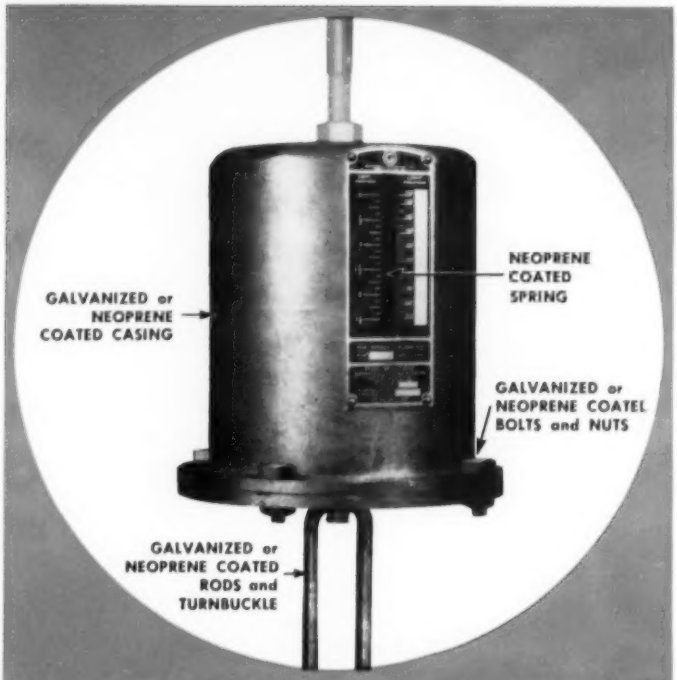
Plastic model aids engineers, contractors in replacement of six old compressors with four new ones for Capitol Hill air conditioning..98

NEW

weather-resistant, corrosion-resistant

GRINNELL VARIABLE SPRING HANGERS...


GALVANIZED or NEOPRENE COATED CASING
NEOPRENE COATED SPRING
GALVANIZED or NEOPRENE COATEL BOLTS and NUTS
GALVANIZED or NEOPRENE COATED RODS and TURNBUCKLE

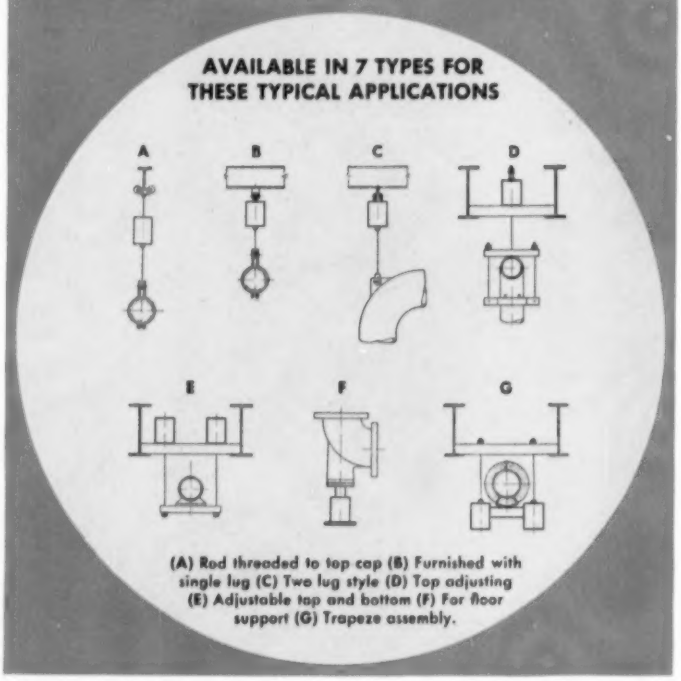
Another Grinnell First!

Grinnell pre-engineered spring hangers are now offered in two new lines to meet the need for spring hangers in installations subject to highly corrosive industrial conditions and to severe weather exposure.

These hangers are the result of extensive experimentation with various coatings for Grinnell's standard pre-engineered spring hangers. In addition to providing flexibility in pipe suspension, they provide versatility of application through their corrosion-resistant characteristics. They are . . .

1. Neoprene coated — for highly corrosive conditions such as those found in chemical plants and refineries. *All* parts of the hanger are neoprene coated to protect the base metal from a wide range of corrosives. The flex life of the spring is unaffected by the neoprene . . . the coating resists cracking or flaking over a wide temperature range.

2. Galvanized — for outdoor installations where weather conditions are severe. All parts of the hanger are galvanized except the spring, which is neoprene coated to avoid alteration of temper, hydrogen embrittlement and decreased flex-life of the spring — usual hazards to springs from the galvanizing process.


AVAILABLE IN 7 TYPES FOR THESE TYPICAL APPLICATIONS
A
B
C
D
E
F
G
(A) Rod threaded to top cap (B) Furnished with single lug (C) Two lug style (D) Top adjusting (E) Adjustable top and bottom (F) For floor support (G) Trapeze assembly.

Along with the obvious advantages of such corrosion and weather-resistant characteristics, consider these features . . .

- Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.
- Precompression* assures operation of spring within its proper working range, as well as saving valuable erection time. Reduced over-all height saves space.
- 18 sizes available from stock for load ranges from 53 lbs. to 12,000 lbs.
- Available in 3 spring lengths for travel ranges of 1¼, 2½, and 5 inches.
- Installation is simplified by integral load scale and travel indicators.

*Precompression is a patented feature.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

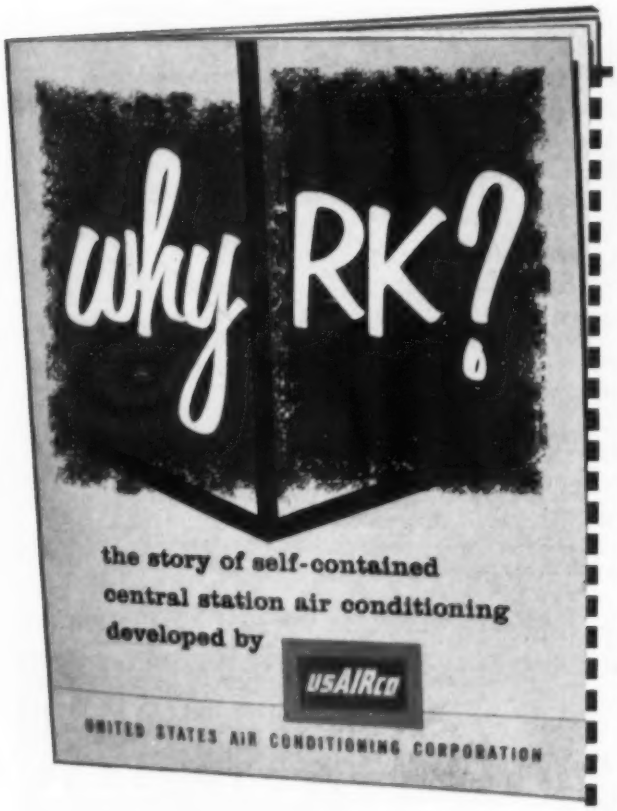
Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

JUST CLIP THE COUPON BELOW AND MAIL!

NOW... a wonderful aid in explaining self-contained central station air conditioning ...yours for a postage stamp!

Your entire organization will want a copy of this new, helpful booklet explaining the development and use of central station air conditioning. Its 36 pages contain the entire history and development of comfort cooling, in non-technical terms. Explaining the basic components of central air conditioning, "Why RK?" describes and illustrates the principle of the refrigeration cycle . . . and develops the explanation in simple, understandable steps. The refrigeration cycle is applied to built-up and packaged units and to the USAIRCO RK central station unit. RK's contain in one cabinet a factory assembled and pre-tested central plant, including built-in evaporative condenser for water conservation. A three-page pull-out shows the treatment of a typical building with built-up, packaged and RK systems. Initial, operating and maintenance costs are compared. This is a basic book that every engineer and contractor should have in his library to help him explain air conditioning to his clients.


why RK?
the story of self-contained central station air conditioning developed by
USAIRCO
UNITED STATES AIR CONDITIONING CORPORATION

USAIRCO

UNITED STATES AIR CONDITIONING CORPORATION

3310 COMO AVENUE S. E. • MINNEAPOLIS 14, MINN.

GENTLEMEN:

Please rush my free copy of the "WHY RK?" booklet.

My name _____

Company name _____

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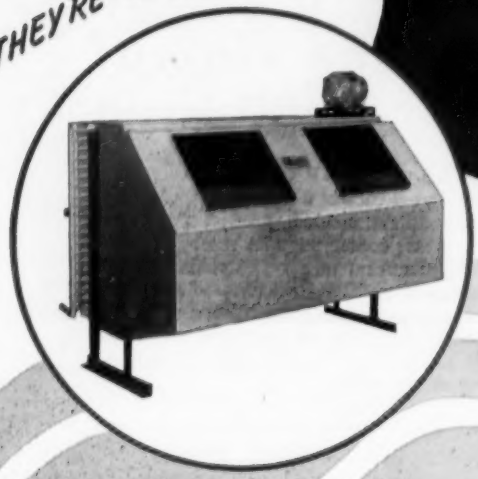
City _____ State _____

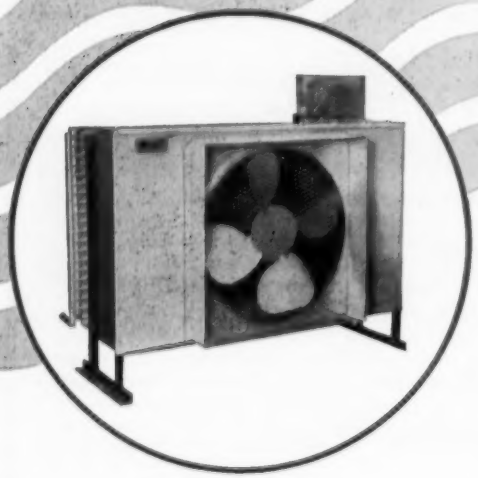
Type of business _____

_____

My position _____

NEW 'BC' UNITS
EXTEND RANGE OF BUSH AIR COOLED CONDENSERS to 20 TONS...





NEW Bush 'BC' Blower Condensers permit air conditioning and refrigeration systems to operate *without water* . . . provide the answer to excessive water costs, limited supply, excessive impurities or disposal problems.

Available in capacities up to the 20 Tons, new Bush 'BC' Blower Condensers feature *low noise level* . . . *quiet operation.*

Patented Inner-Fin coil construction, *a Bush exclusive,* makes these the most compact units on the market. Units are easy to install, have rugged all-steel cases with durable rust-resistant finish . . . are available arranged with either blower fan or propeller fan.

The BUSH line of water-savers, most complete in the industry, also includes:

'CDT' COPPER DECK COOLING TOWERS with all copper decking. **'IEC' INNER-FIN EVAPORATIVE CONDENSERS** featuring patented inner-fin coils. Both units available with blower or propeller fan. Capacities from 3 to 90 Tons.

'PFC' PROPELLER FAN CONDENSERS — Two basic models, 2.2 Tons and 3.3 Tons can be combined by mounting in banks to obtain any desired tonnage.

'PS' PRESSURE STABILIZERS — automatically maintain satisfactory head pressure when air cooled condensers operate outside in low ambient temperatures.

Write direct for complete information or contact your experienced BUSH representative for valuable engineering and application assistance.

BUSH MANUFACTURING COMPANY • West Hartford 10, Conn.

RIVERSIDE • CALIFORNIA

BUSH

Heating Piping & Air Conditioning

Vol. 28 No. 7

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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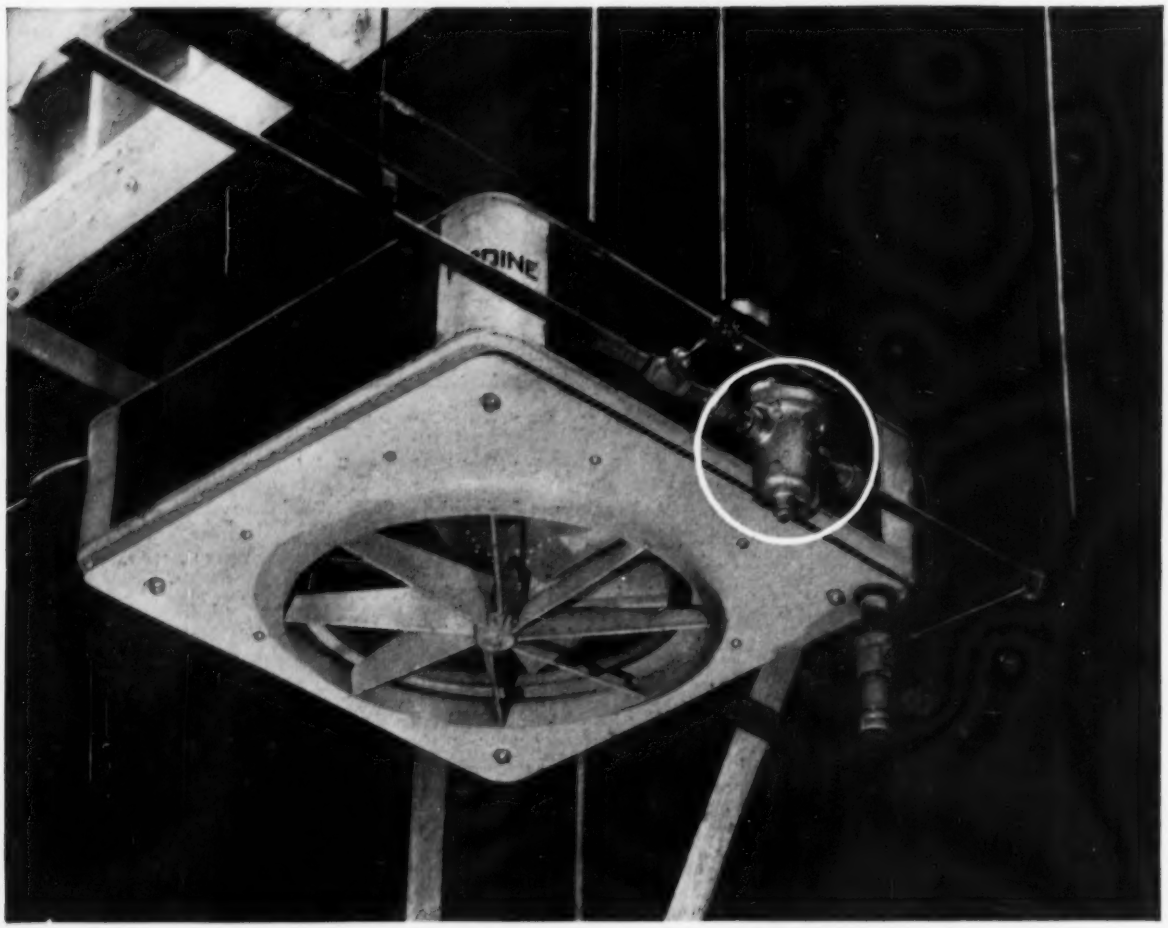
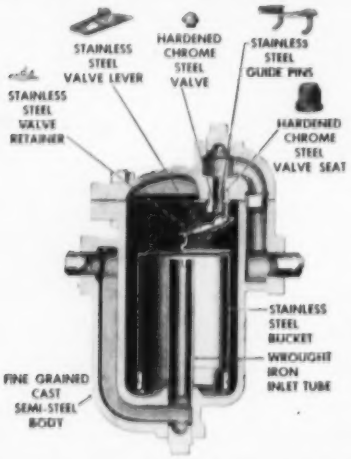


How Corrosion of Unit Heaters is Prevented by Good Trapping


STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY

Good Traps. The mechanisms in Armstrong traps for unit heaters are substantially identical in design, workmanship and materials to those used in traps for 900 lbs. pressure, 900 degrees F.

Cause. Costly corrosion of unit heaters is frequently the result of sluggish condensate drainage and inadequate venting. Any carbon dioxide gas present in the steam supply will go into solution if the condensate is below steam temperature, forming corrosive carbonic acid. Presence of oxygen aggravates the corrosion.

Remedy. Armstrong traps prevent carbonic acid formation because they discharge condensate *at steam temperature* and vent CO_2 and air at the same time. There is never any accumulation of condensate and incondensible gases to cause trouble as can occur with traps that must wait for condensate to cool before they will open.

Trap Selection. It is important that the traps be correctly sized, with a generous safety factor to provide adequate air handling capacity. Armstrong sizing recommedations are thoroughly reliable, being based on actual performance of the traps under operating conditions rather than on theoretical considerations.

Complete Details. Ask for Armstrong Bulletin No. 2312 which tells how to select and install traps for any type of unit heater. For your free copy, call your local Armstrong Factory Representative, or write:

ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Michigan

ARMSTRONG STEAM TRAPS *Application Engineered*

AIR CONDITIONED STOCKINGS under Taylor Control!

AIR CONDITIONING plays an important part in the manufacture of the high quality full fashion hose for which Bossong Hosiery Mills, Inc., have such a fine reputation. At their Asheboro, North Carolina plant they rely on a Taylor controlled Buensod-Stacey air conditioning system to maintain just the right operating conditions.

"The hosiery business is highly competitive today," says Mr. P. W. Redding, Bossong Plant Engineer, "and it's very important that an air conditioning system meets our exacting requirements and is economical to operate. Top quality controls are essential to do this."

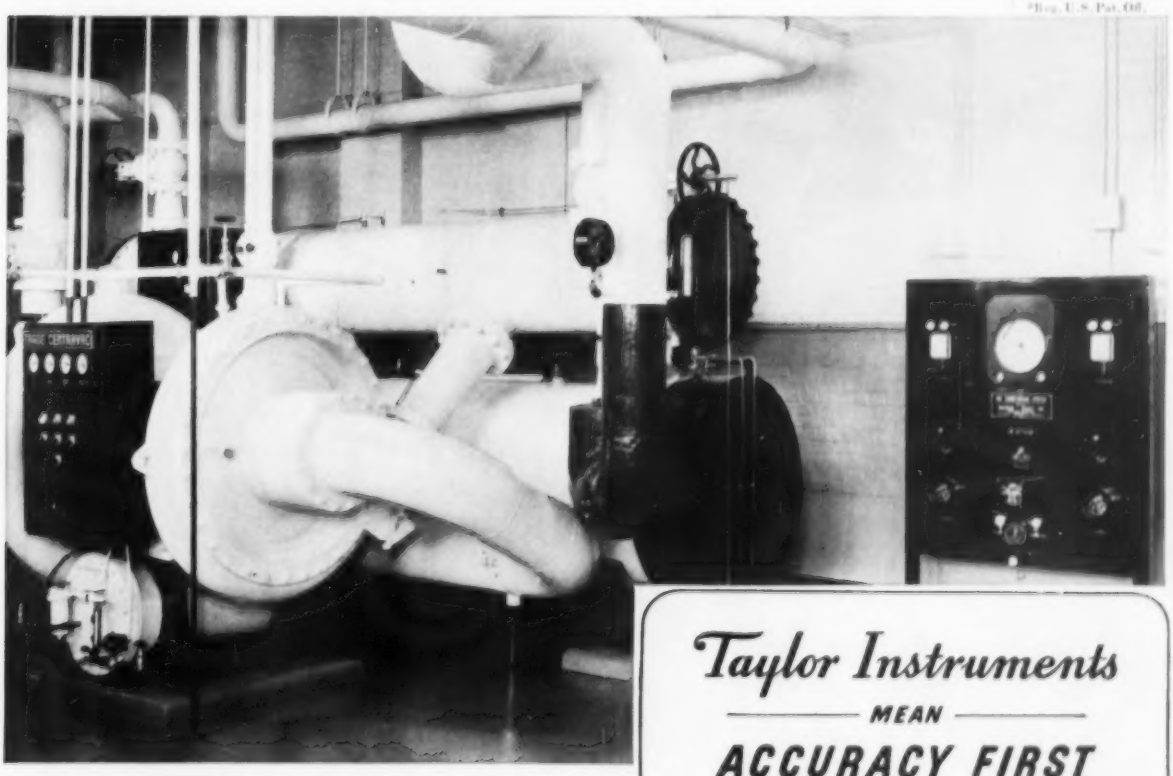
The Taylor FULSCOPE* Recording Temperature Controller with adjustable sensitivity and automatic reset is the main chill water controller. It handles from 10% to 100% loads by positioning inlet vanes on the two compressors, either or both of which are used, depending on the load. Also shown is a Taylor 10RF Pressure Controller operating the relief valve on decrease of load to maintain proper flow through the evaporator.

Other instrumentation (not shown) includes a Taylor Recording Controller with the averaging type of long capillary bulb and automatic reset. It operates outside and return dampers, a steam valve and a chilled water valve with sequence operation. A Taylor Wet Bulb Controller permits economy of operation by using outside air for evaporative cooling until outside conditions rise to the point where refrigeration is needed.

This is one of the many large industrial air conditioning projects on which Buensod-Stacey and Taylor have successfully collaborated. If you have a similar problem why not call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Reg. U.S. Pat. Off.



One of the two-stage centrifugal compressors in the Taylor controlled Buensod-Stacey air conditioning system in use at the Asheboro, N. C., plant of Bossong Hosiery Mills, Inc.

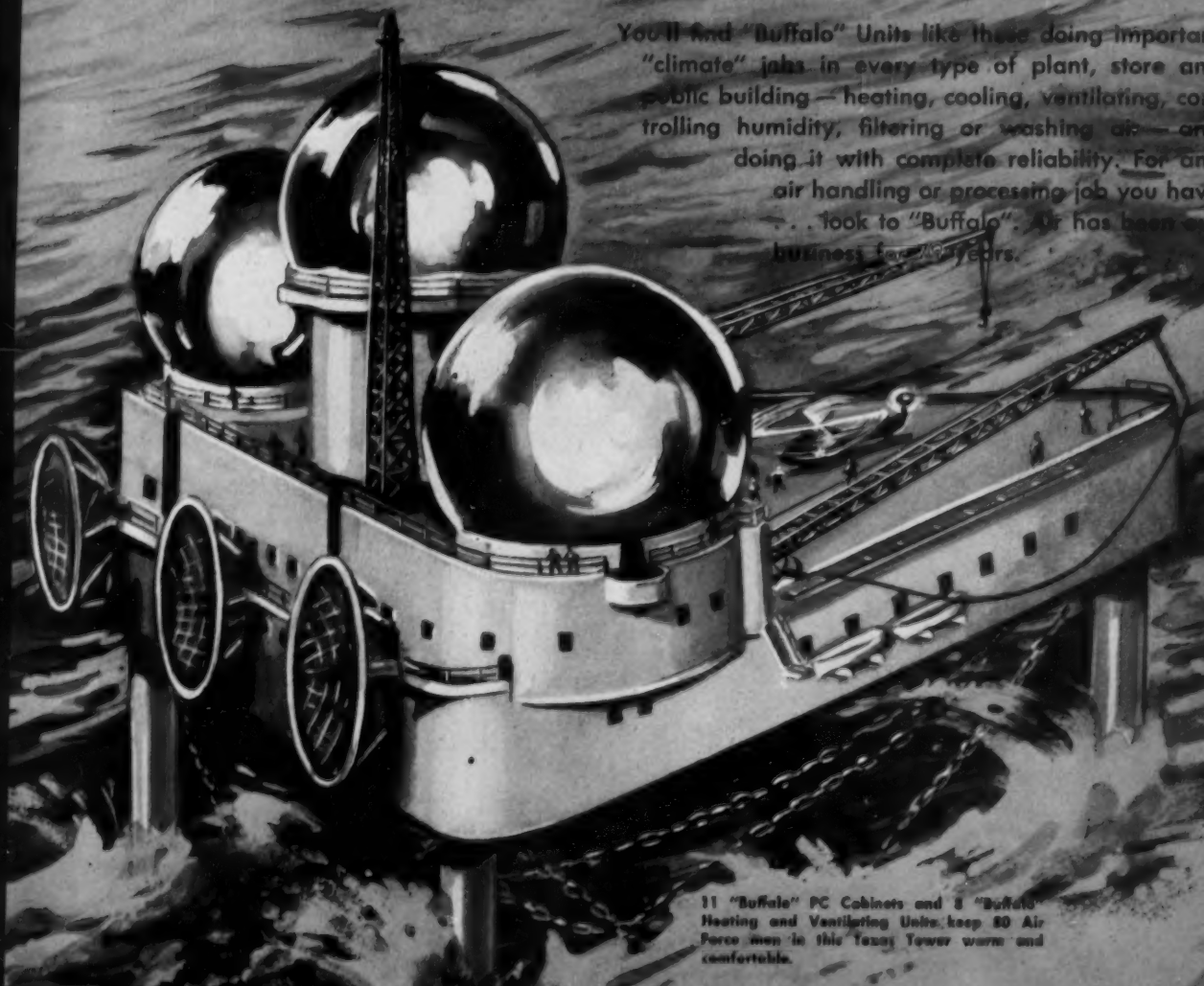
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

"Buffalo" units maintain air comfort 'ATLANTIC WATCH

This radar-equipped Tower, standing continuous long-range lookout over the Atlantic, takes a lot of rough weather — yet it's always comfortable inside. 19 dependable "Buffalo" Air Conditioning and Heater Units see to that.

The "Buffalo" Heaters warm the fresh air drawn in from outside for the living quarters while the "Buffalo" Cabinets maintain accurate temperature control and clean, filtered air in the radar control room.

You'll find "Buffalo" Units like these doing important "climate" jobs in every type of plant, store and public building — heating, cooling, ventilating, controlling humidity, filtering or washing air — and doing it with complete reliability. For any air handling or processing job you have . . . look to "Buffalo". Air has been our business for [illegible] years.



11 "Buffalo" PC Cabinets and 8 "Buffalo" Heating and Ventilating Units keep 80 Air Force men in this Texas Tower warm and comfortable.

"Buffalo"

BUFFALO FORGE

BUFFALO,

Canadian Blower & Forge Co., Ltd.,

in our

TOWERS"

VENTILATING

AIR CLEANING

AIR TEMPERING

INDUCED DRAFT

EXHAUSTING

FORCED DRAFT

COOLING

HEATING

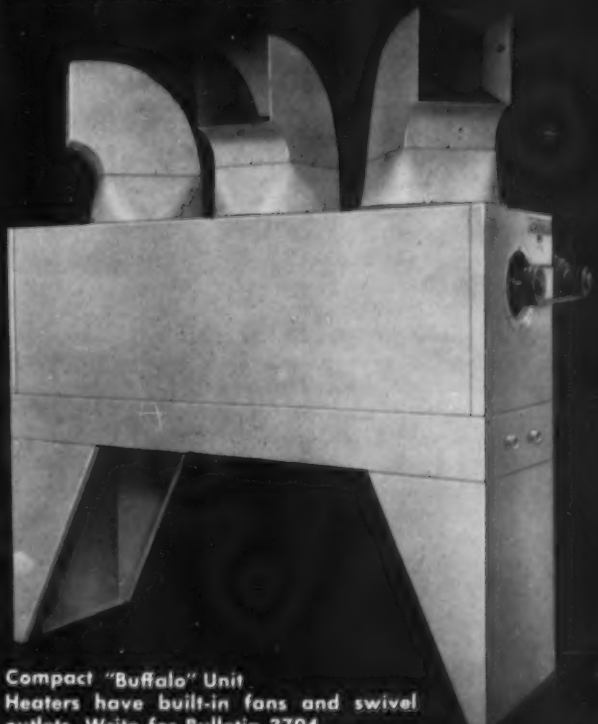
PRESSURE BLOWING

COMPANY

NEW YORK

Kitchener, Ontario

"Buffalo" PC Cabinets provide any desired combination of air conditioning functions. Write for Bulletin 3703.



Compact "Buffalo" Unit Heaters have built-in fans and swivel outlets. Write for Bulletin 3704.

Good control is essential to good air conditioning performance. For years, the size of the big system has justified the expense of good conventional controls and a skilled supervising engineer. But what about smaller jobs—retail stores, theaters, supermarkets? Their day has come with electronics. The pioneer manufacturer of electronic controls for air conditioning tells why.

Electronics – new era in air conditioning

Honeywell Electronics gives non-technical business managers expert control of air conditioning—brings big-system convenience, economy to installations of any size.

Honeywell Electronics
Report Number Three

ENGINEERS and architects have suffered some nasty headaches trying to give the small-to-medium-sized job good air conditioning control at a reasonable price.

That picture has changed. For these jobs, the *best* control now can be specified: Honeywell Electronics.

There are many good reasons why electronic temperature control is of special value to the smaller building. One of them is simplicity.

Sensing element of the electronic thermostat, a Honeywell development, is a simple strand of wire. Yet it provides a means of sensing and correcting temperature changes quickly and accurately, without bulk, clumsy linkages or moving parts.

Such basic simplicity paves the way for the most desirable feature possible in small-system air conditioning—automatic operation, with its convenience, efficiency and economy.

With electronic temperature control the full capacity of the air conditioning equipment may be utilized automatically. This makes operation more *convenient:* the *same* thermostat may sequence from heating to full ventilation to mechanical cooling. Operation is more *economical:* automatic use of outside air to carry part of the cooling load does a lot to cut refrigeration costs.

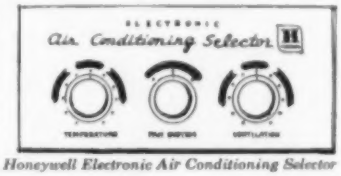
Especially valuable for short-occupancy spaces such as retail stores is the faster, more accurate, more stable compensation that's achieved through electronics. It adjusts quickly for varying load changes; it also prevents discomfort from variations of wind and sun effects, or sudden changes in outdoor temperature.

Automatic winter-summer reset using an outdoor thermostat cures temperature drift in winter, air-cooling shock in the summer months. This means *consistent* comfort—in any kind of building, no matter what the weather does in any season.

Thus for the first time, thanks to electronics, the smaller building manager can have first-rate air conditioning control performance with simple, dependable equipment that he can operate himself.

The Electronic Control Center

Perhaps the single most valuable aspect of electronic temperature control in the smaller building is the electronic central control panel. These are Honeywell panels, each designed to meet the requirements of individual installations. They give the building manager advantages available in no other type of control installation at a comparable price.



Honeywell Electronic Air Conditioning Selector

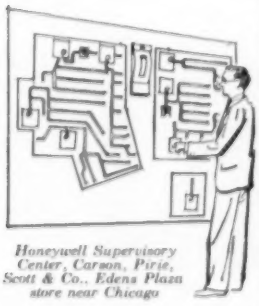
for smaller buildings

The simplest panel, the air conditioning selector illustrated above, gives a single non-technical man expert control of the building's heating and cooling equipment. At his fingertips, the store or office manager has the means for turning air conditioning on or off, for raising or lowering the temperature; for ventilating to meet exact needs.

Other Types

Another type of Honeywell panel is the Supervisory DataCenter for electronic control installations. An example is the one designed for a new suburban branch of Carson, Pirie, Scott & Co., Chicago department store.

Like the air conditioning selector mentioned above, this panel allows space temperature to be selected from any convenient location. In addition, it contains a floor plan of the store; graphic representation of thermostat placement on all three floors; and temperature indication at each of the control points in the system—all shown on the panel. Yet it still may be operated by the non-technical building manager.

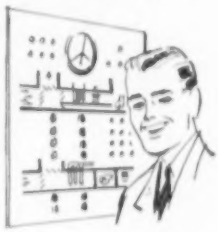

Honeywell Supervisory Center, Carson, Pirie, Scott & Co., Edens Plaza store near Chicago

A more sophisticated form of control is provided by the Honeywell three-zone Supervisory DataCenter in the Shreveport Club, Shreveport, Louisiana. Shown on the panel is a flow diagram of the air conditioning system, plus space temperatures; again, it allows one man complete control of the system, assuring a pleasant environment for all public areas and private rooms without an expensive technical staff.

The Supervisory DataCenter

The benefits of electronic central control are by no means restricted to smaller installations. In huge modern buildings with full maintenance crews, a Honeywell Supervisory DataCenter, set up anywhere within the building, provides a focal point from which every vital function of the air conditioning system is checked and directed. Adjustments anywhere in the system may be made at the panel, reducing manpower needs and increasing efficiency.

Properly equipped with Honeywell instruments, the electronic Supervisory DataCenter can keep permanent performance records of heating and cooling components, assuring maximum fuel and power savings.


Honeywell three-zone Supervisory Center, Shreveport Club, Shreveport, La.

No specialist is needed for installing and servicing electronic controls. Wiring is low voltage, with standard color coding easily understood by any heating and air conditioning technician. Today's installations will be up-to-date for many years to come. Maintenance and equipment aging problems are minimized, because the electronic thermostat contains no moving parts.

Key Word: Flexibility

These advantages are summed up in one word: *flexibility*. It means that all or any combination of the electronic installation's features are readily adaptable to the solution of specialized control problems. The results are better, more efficient, more convenient operation of the air conditioning system—and important dollar savings.

In fact, it's *flexibility*—in the entire field of temperature control—that helps establish clearly Honeywell's leadership. For only Honeywell makes *all three types* of control systems: pneumatic, electric, electronic, each with distinctive advantages for certain applications. Thus only Honeywell is able, with complete objectivity, to help you select the one system shaped perfectly to the needs of the building and its occupants.

* * *

Ask for our new electronic control booklet which tells more fully how to apply electronics to your control problems. Write Honeywell, Dept. 1004, Minneapolis 8, Minn.

Minneapolis-Honeywell Regulator Company

EQUALLY EFFICIENT FOR HEATING AND COOLING • FULLY ADJUSTABLE FOR ALL AIR PATTERNS • FOR EXPOSED DUCTWORK OR FLUSH MOUNTING • EXTREMELY QUIET • RIGID STEEL CONSTRUCTION EASY TO INSTALL • BEAUTIFUL METALESCENT ALUMINUM FINISH

diffusers

designed by TITUS

Here—beyond doubt—is America's most attractive, most *exciting* new line of ceiling diffusers! *Exciting* because of ultra modern styling that brings to any room a dignified "room of tomorrow" appearance . . . *Exciting* because of a new air control design that provides superior air diffusion performance.

Titus' new exclusive CURVED CONTOUR cone design—plus extreme adjustability—makes these outstanding precision air diffusion outlets EQUALLY EFFICIENT WHEN HANDLING EITHER COOLED OR HEATED AIR.

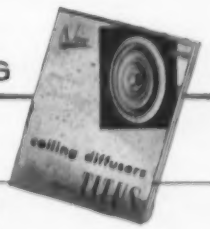
Extra simple to install. Save time and labor. Easiest in the world to adjust to any air pattern—before or after installation—without changing relative position of three center cones. Available in fixed cone and fully adjustable models, in all sizes . . . at truly realistic prices.

Also a complete new line of Titus designed, Titus engineered accessories—including ceiling cones and radial volume control dampers.

Write today—learn how this amazing new line of ceiling diffusers can offer you new stimulating design opportunities—and save you money on every overhead installation.

FOR HANDLING OVERHEAD AIR Gracefully WITH PRECISION

MAIL COUPON FOR NEW FREE CATALOG



TITUS MANUFACTURING CORP., WATERLOO, IOWA

Gentlemen: I am interested in complete information on your *exciting new line* of CEILING DIFFUSERS AND ACCESSORIES. Rush me NEW FREE CATALOG.

Name

Address

Company

City State

500-Room Hollywood Beach Hotel, Hollywood-by-the-Sea, Florida, was recently air conditioned, using a York TURBOMATIC system.

Ruskin Apartments, Pittsburgh, Pa., are air conditioned by a York TURBOMATIC system, making living more comfortable, healthful.

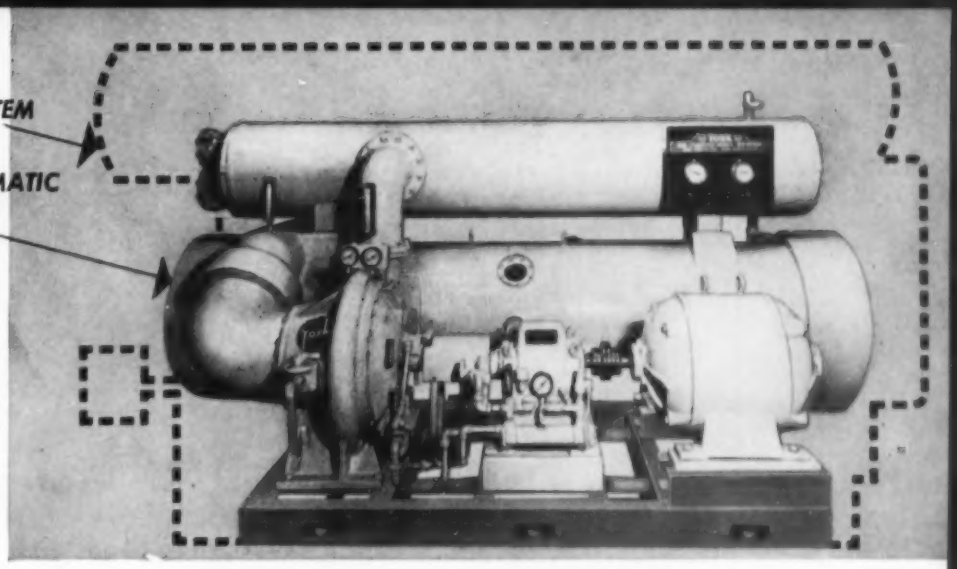
York TURBOMATICS make an air conditioning

Two Moore-McCormack liners, now being built by Ingalls Shipbuilding Corp., will be air conditioned with York equipment including TURBOMATICS. The system will help make trips to hot climates even more enjoyable.

Colgate-Palmolive Building, N.Y.C., is another new building air conditioned with York TURBOMATIC equipment.

Doctors Building, Atlanta, Ga., is air conditioned with a York TURBOMATIC system supplying chilled water for the cooling.

The Dayton Biltmore, Dayton, Ohio, (a Hilton hotel) is air conditioned by the lightweight, smaller sized York TURBOMATIC unit.



SMALLER, LIGHTER. By virtue of its smaller size and lighter weight, the York TURBOMATIC (shown here in comparison to a previous design multi-stage unit of the same capacity) can be mounted on upper floors without any major structural changes.

system lighter, smaller, more flexible

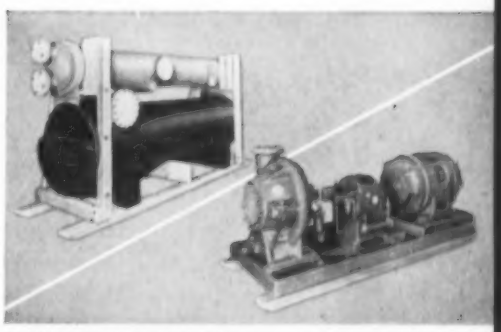
The heart of the York TURBOMATIC water cooling system for air conditioning is the TURBOMATIC compressor, a powerful single-stage unit of advance design. It gives users these important benefits:

1. Saves space, weight. A 350 horsepower TURBOMATIC system can be installed in 120 square feet of space. It weighs considerably less than former systems of the same capacity. This economy of size is important to the builder who wishes to conserve rentable space and to the architect who may wish to mount the system on a high floor without expensive load-bearing structural work.

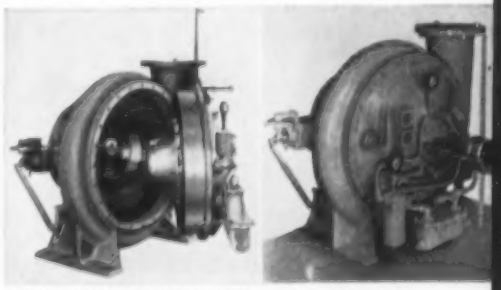
2. Matches your power source. You can buy the TURBOMATIC system equipped with the motor of your choice, or you can use any other power source . . . a steam turbine drive, for instance.

3. Simple to operate and maintain. The TURBOMATIC compressor has only one-quarter the number of parts of previous units. It has a minimum of gasketed joints, and since it is automatic, it can easily be controlled as to need no attendant, even for starting and stopping!

York TURBOMATIC systems have already been proven in operation (see left hand page) and have established fine records for trouble-free operation. For more information, get in touch with your nearest York sales office. You'll find the telephone number listed in your Classified Directory under "Air Conditioning Systems."



EASY INSTALLATION. The system is shipped on two skids, is practically ready-assembled. Customer may specify motor or use another power source.



ECONOMY OF DESIGN. York has streamlined the TURBOMATIC to one-quarter the number of parts in previous systems, making maintenance easier.

York refrigeration air conditioning

the quality name in air conditioning

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

YORK CORPORATION

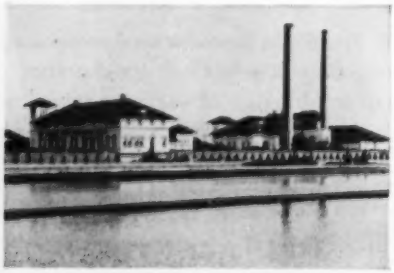
The challenge of integrity

A reputation for integrity—daily challenged and daily put to test—is established only through years of proven performance. Pennsalt's 106-year history of supplying top-quality products and service to industries depending upon close control of quality has met the challenge and established the reputation.

On the opposite page are details about Pennsalt's new ISOTRONS—the latest word in fluorinated refrigerants. The air-conditioning and refrigeration industries can depend on the integrity of Pennsalt to stand behind the ISOTRONS for quality, uniformity, performance, and value.

PETROLEUM REFINING calls for the utmost precision in raw-materials supply and processing. Pennsalt chemicals meet industry's rigid standards of purity & uniformity.

HIGH-ALTITUDE FLIGHT relies on Pennsalt fluorine and chlorine trifluoride to provide the exact oxidizing power for blazing rocket fuels.



HUMAN LIVES AND HEALTH depend on the purity of drinking water. Municipal water systems throughout the country use Pennsalt chlorine for purification.

ISOTRON

THE LATEST WORD IN REFRIGERANTS

Pennsalt—a pioneer in modern fluorine chemistry—proudly announces the ISOTRON* line of refrigerants, soon available in commercial quantities from a new Pennsalt plant now being built at Calvert City, Kentucky. Of highest quality, competitively priced, and COMPLETELY INTERCHANGEABLE with other fluorinated refrigerants, ISOTRON products are geared to the rapidly increasing demands of this industry.

The new ISOTRON line will include ISOTRON 11, ISOTRON 12, ISOTRON 22, and ISOTRON 113—backbones of the fluorinated refrigerant field. They're of precisely the same formulas as other products of this kind, and they'll be manufactured with the rigid quality control you expect of Pennsalt. Optimum quality and uniformity are assured.

IF YOU USE FLUORINATED REFRIGERANTS investigate the advantages of ISOTRONS. Benefit from Pennsalt's pioneering research and progressive thinking in refrigerant manufacturing! Pennsalt offers you well-staffed sales-service laboratories, and specialists who are eager to work with you. Learn all the facts about ISOTRON refrigerants—write Technical Services Dept. 330, Industrial Chemicals Division, Pennsylvania Salt Manufacturing Company, Three Penn Center Plaza, Philadelphia 2, Pa.

*ISOTRON IS A TRADEMARK OF THE PENNSYLVANIA SALT MFG. COMPANY

Pennsalt Chemicals

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KRITZER offers a full line of *heating and cooling equipment*

You can sell QUALITY — and *PROFIT!*

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ASK YOUR JOBBER FOR KRITZER PRODUCTS

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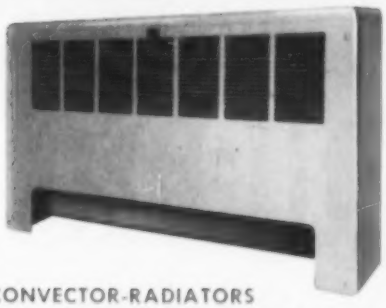
Low cost, combination heating and cooling units for residences, apartments and motels. Two models fit between studding. Easy installation. Clean, filtered air both summer and winter. Insulated enclosures prevent condensation. Individual room control optional. Free-standing types for remodeling.

HYDRO-PAC® WATER CHILLERS

Completely packaged. Factory tested. Ready for easy field installation. Fine "furniture" steel cabinets with baked enamel finish. Five year warranty on hermetic system.

UNIT HEATERS

Horizontal and vertical discharge, propeller fan types. Wide selection of sizes for steam and hot water. Die formed cabinets of heavy gauge steel. Baked-on, gray hammer enamel finish. Rubber mounted motors. Dynamically balanced fans in deep drawn venturi for quiet operation.



CONVECTOR-RADIATORS

Floor, wall hung and recessed models. Famous KRITZER coil construction for steam and hot water. Bronze headers. Heavy, reinforced steel cabinets. Full range of sizes. Chain or knob operated dampers. Cabinets phosphatized. Gray prime baked-on finish.

"K" LINE RADIANT BASEBOARD

Clean, modern lines. Quiet. Easy to install. For homes, apartments, offices.

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For hard-to-heat areas. Large heating capacity. Safe, rounded edges and corners.

TYPE "R" AIR BASE

WARM AIR BASEBOARD

adds beauty to any home. Efficient warm air heating or cooling. Two and four foot lengths. Built to last.

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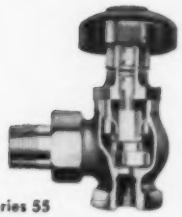
Heating Systems

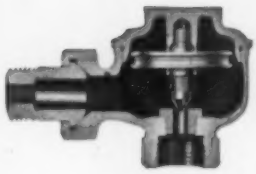
To the architect and engineer an Illinois Control System of Steam Heating means lasting client satisfaction; to the heating contractor, simplicity and ease of installation; to the owner, a sound investment in comfort, convenience and fuel economy.

Illinois Control Heating Systems are found in schools, hospitals, churches, apartments, commercial and public buildings of every type from coast to coast. They are offered in five types, and cover the complete range of vacuum and vapor heating requirements.

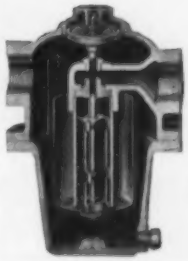
Consult the representative nearest you in our nation wide service.



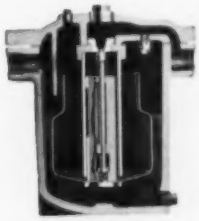
Series 55
Radiator Valve



Series G
Radiator Trap

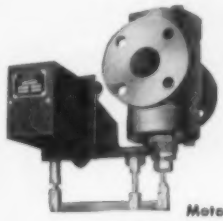


Float and
Thermostatic
Trap



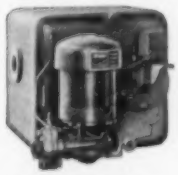
Series 35 Steam Trap

Pneumatic
Zone Control
Valve

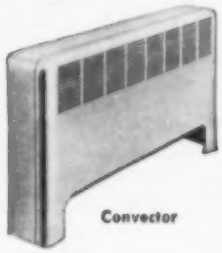


Motorized
Zone Control Valve

ASU Heat Exchanger



Condensation Pump



Convector

Illinois Heating System Specialties

Installing Illinois Specialties, either in new projects or to replace present worn equipment will insure maximum service and economy. Illinois systems are scientifically balanced. All specialties are of our own manufacture, designed for coordinated operation. Manufacturing a complete range of devices enables us to select those that will give the desired results under the most exacting and widely varying requirements.

Illinois Power Specialties

In addition to the equipment illustrated there is also a complete line of power specialties—for medium and high pressures.

No matter what your problem in the handling or control of steam and condensate may be, we will be glad for the opportunity to discuss it with you.

Write for bulletins

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ILLINOIS ENGINEERING COMPANY

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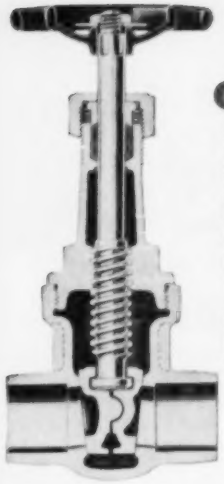
DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

NEW LUNKENHEIMER SOLDER-END VALVES for COPPER TUBING



GATE

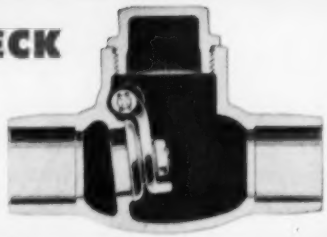
FIG. 2131
½" to 2"
125 lb. S.P.
200 lb. W.O.G.
Rising Stem
Double Wedge Disc

FIG. 2132
Solid Wedge Disc

FIG. 2133
Non-Rising Stem
Single Wedge Disc

SWING CHECK

FIG. 2145
½" to 2"
125 lb. S.P. 200 lb. W.O.G.
Renewable
Bronze Disc and Side Plugs



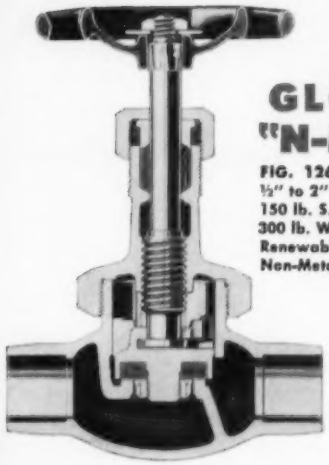
Easier, tighter installation! Lasting, trouble-free service!

Now you can take advantage of the superior quality, advanced design, and outstanding performance of famous Lunkenheimer Bronze Valves for your copper tubing installations!

The complete line of five patterns, with precision machined bores and ends, is designed for use with types K, L, and M copper tubing.

In operating features, materials, and workmanship, these valves are identical with the corresponding Lunkenheimer figures in the Screwed-End Bronze Valve series:

- *Non-Slip Handwheel assures tight closing*
- *Famous Stemalloy Stem—millions in use, without a single failure*
- *Hexagon Head Gland for easier repacking*
- *Extra-deep Stuffing Box reduces servicing*
- *Repacking Seats above stem threads*
- *Body and Bonnet of dense, close-grained, corrosion-resistant bronze*



GLOBE "N-M-D"

FIG. 126
½" to 2"
150 lb. S.P.
300 lb. W.O.G.
Renewable
Non-Metallic Disc

LUNKENHEIMER ® QUALITY

FOR COMPLETE DETAILS ON THE NEWEST AND BEST SOLDER-END VALVES see your Lunkenheimer Distributor or request literature from The Lunkenheimer Company, Box 360, Cincinnati 14, Ohio.

L-855-18

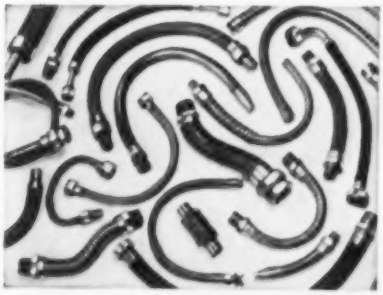
BRONZE • IRON • STEEL • PVC

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

American Vibration Eliminator absorbs vibration in piping leading from refrigeration compressor . . . stills noise, ends piping failures.

Standard line of flexible metal connectors simplifies isolation of vibration in rigid piping



Typical American flexible assemblies available to convey both liquids and solids, absorb vibration, compensate for contraction and expansion in rigid piping; connect moving parts, misaligned ports; and to protect delicate tubing, wiring.

UNCONTROLLED vibration in pipelines often results in objectionable noise, cracked piping, high maintenance costs, and expensive shutdowns.

American engineers have designed a number of flexible metal hoses, connectors and conduits that are widely used by design engineers and others to solve this problem.

American Vibration Eliminators (illustrated here)—short sections of seamless flexible bronze (98¾% copper, 1¼% tin) tubing used to minimize noise and vibration in rigid piping of air conditioning, refrigeration and other installations may be adapted to your product or problem.

Flexpipe* standard flexible connectors—seamless, tin bronze tubing, corrugated for flexibility, with tin bronze wire braid covering—used in wet heat systems by contractors, and in other installations to convey air, gas, oil, steam or water, dampen noise in piping, take care of expansion and contraction, simplify installations.

Sealtite* flexible, liquid-tight conduit—tough polyvinyl chloride jacket extruded over flexible metal core—protects wiring outdoors and in . . . in wet or corrosive spots. Highly flexible: takes up movement, absorbs vibration, easily installed.

Whatever your piping problem, there is a standard American flexible metal assembly right for the job, or American engineers will design one to your specifications at no extra cost. For more information, write for Catalog CC-400. The American Brass Company, American Metal Hose Division, Waterbury 20, Conn.

*Trade Mark

WHEREVER CONNECTORS MUST MOVE

AMERICAN

FLEXIBLE METAL HOSE AND TUBING

an **ANACONDA®** product

NEW FASHION IN FANS: *IM-pak

*UTILITY'S *IM-pak SIMPLIFIES PRODUCTION CHANGES.* This new fashion in fans now eliminates top-heavy inventories of many unassembled parts, gives you an across-the-board stock of blowers that covers up to 98% of applications for residential air-moving equipment. Available in five sizes, you'll now be able to handle model changes *while in production.* Convertibility is the key: The two housing supports and motor mount bracket are not attached to the unit, but are included in the package with all hardware needed for rapid installation. Simply mount the motor and adjust the angle of discharge to any of *four* positions, and – presto! – the job is done. No oil cups snarl service due to IM-pak's sealed ball bearings. Blowers are also available with a specially designed interchangeable sleeve bearing mount which is easily adjustable and permits rapid production-line switches to your requirements. This fast-adapting blower is another outstanding example of Utility's never-ending search for better engineering methods that pay off where it counts – in lower labor costs, reduced inventories and trouble-free service in your equipment. *YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE!*

A Division of Utility Appliance Corp.

UTILITY FAN CORP. *911 East 59th Street, Los Angeles 1, California*

MANUFACTURERS OF HEAVY AND STANDARD DUTY BLOWERS FOR HEATING, AIR CONDITIONING AND VENTILATING INSTALLATIONS. PRODUCERS OF BLOWERS AND BLOWER PARTS FOR ORIGINAL EQUIPMENT MANUFACTURERS. WRITE FOR CATALOGUE DATA.

"That's a handsome ceiling . . . it's a pity you'll have to spoil it with air diffusers."

"That's where you're wrong! The diffusers are already in place . . . we're using completely concealed MULTI-VENT . . ."

The integrity of a clean, attractive ceiling can be maintained unbroken when you work with Multi-Vent low velocity air diffusers.

Multi-Vent diffusers can be completely concealed. Nothing protrudes to create problems in symmetry or architectural effect.

This concealability provides still another advantage at a practical level: Partitions can be placed anywhere, and re-located at will with complete freedom. The Multi-Vent panels need not be moved, altered in any way, or even adjusted.

Multi-Vent introduces conditioned air through the perforations in standard acoustical ceiling pans, at low velocity. The air is gently diffused downward into the room. As a result, there is no "throw" or "blow" to bounce off partitions—which can actually bisect a Multi-Vent panel without affecting its function.

Write for detailed literature and name of representative in your area.

multi-vent

DIVISION OF
THE PYLE-NATIONAL COMPANY

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"Packaged"

Janitrol Heavy Duty Heaters Simplify System Planning And Installation For Central Heating And Air Conditioning

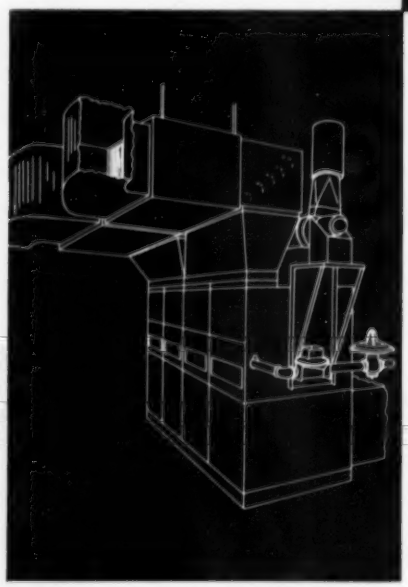
YOU can combine up to seven of these powerful heavy duty blower heater sections on a single, rigid steel base frame—provide up to 1,750,000 Btu/hr. input capacity (250,000 Btu. per section). You select from a wide range of standard blowers and motors to insure the right combination for correct air delivery and temperature rise in each application. And installation is speedy, because complete factory assembly and testing saves time on the job.

SUMMER AIR CONDITIONING EASILY ADDED

Evaporator cooling coils are easily mounted in the outlet plenum, when summer cooling is desired. Powerful 15" centrifugal blowers, cushioned in rubber, deliver ample air to overcome resistance of evaporator coils and duct system. A single motor drives blower fans in multi-section installations.

All Janitrol Heavy Duty Heaters are protected from burn-out, corrosion and cracking by the famous Janitrol Multi-Thermex heat exchanger with fire-fused protective coating. Dual-fuel manifold and controls to operate on natural or LP gas are optional.

Warm air from this 1,000,000 Btu (4-unit) central heating plant is distributed through the duct system to heat a modern elementary school. While strength and sturdiness are maintained in their construction, Janitrol heavy duty heaters are not too heavy for installation on overhead platforms, when it is desirable to save floor space.



This schematic drawing shows how cooling coils can be easily added in the outlet plenum to supply summer air conditioning.

. . . for complete specifications and data on Janitrol heavy duty blower heaters, write for bulletin JS-247.

Janitrol
HEATING AND AIR-CONDITIONING DIVISION
SURFACE COMBUSTION CORPORATION
COLUMBUS 16, OHIO
In Canada: Moffat Heating and Air Conditioning Div. of Moffats Ltd., Toronto 15.

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES AND *Kathabar* HUMIDITY CONDITIONING

Wolverine commercial straight length tubing is available in a wide range of sizes and tempers in both copper and aluminum.

Wolverine Trufin*—the integral finned tube—boosts heat transfer performance. Available in copper, aluminum, steel and in a bimetallic form.

YOUR BUY WORD *in Copper* ...WOLVERINE

Wolverine is equipped to make simple or complex bends to customer specifications. Other fabrication services include such operations as beading, swaging, flaring, expanding, reducing, etc.

Wolverine's Copper Spun End Process** produces one-piece tubular-shaped parts in one fast, economical operation.

Wolverine copper-to-aluminum connectors permit the use of both metals in the same refrigeration system—are available in ⅜" and ⅝" tube diameters.

Wolverine Capilator*, copper capillary tube, assures precision metering of liquids, gases and air.

Here are six copper tube ideas—each designed to do a vital job in your product—each designed to save you time and money. All of them result from Wolverine's years of metalworking experience, constant research, and the imagination of skilled engineers. All products typify creative Tubemanship in action.

When your specifications call for copper and copper-base alloy tubing and tubular-shaped parts, remember Wolverine as your "buy" word. Remember, too, that Wolverine also manufactures a complete line of aluminum tube products as well. Wolverine's General Products Catalog has the complete story. Write for your copy today.

Wolverine Tube, 1461 Central Ave., Detroit 9, Mich.

*REG. U.S. PATENT OFFICE

**A PATENTED PROCESS REG. 22465

There is a difference in tubing and Tubemanship is that difference!

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WOLVERINE TUBE

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Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

Wolverine Trufin is available in Canada through the Unifin Tube Company, London, Ontario.

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPARTMENT, 13 EAST 40TH STREET, NEW YORK 16, NEW YORK.

LINE UP with SPORLAN for Right-Down-the-Line PEAK PERFORMANCE on All Air Conditioning Installations

No matter how large or small the system, there's a perfect Sporlan hook-up available from Catch-All to Distributor

Everyone knows about Sporlan Catch-Alls, the perfect Filter-Driers. They assure you filtering instead of straining. Dirt-free, sludge-free systems are the result. Harmful corrosive acids are adsorbed and retained. In addition, they dry down to an end point so low that any remaining moisture is absolutely harmless.

The new Sporlan Solenoid Valves offer even greater Peak Performance with the new power-packed Blue Seal Coil. No more worries over electrical failures. They're really tight closing, too!

Sporlan Thermostatic Expansion Valves with the exclusive Flow-Master element, are your guarantee against hunting. Alternately starved and flooded evaporators will never plague you again with these Peak Performers!

Uniform distribution to all circuits are yours with Sporlan Peak Performance Distributors. Their perfectly designed conical button and interchangeable nozzles give them greater flexibility and a much larger range of application.

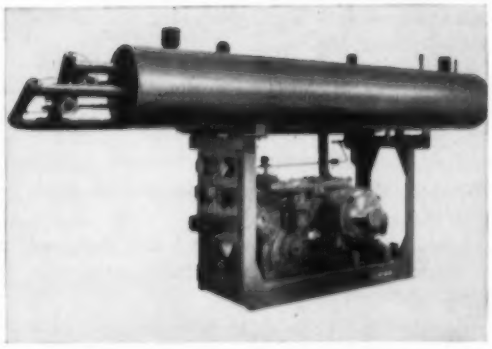
So for Right-Down-The-Line Peak Performance on all air conditioning systems... Line up with Sporlan and get Peak Performance on every installation.

SPORLAN

SPORLAN VALVE COMPANY
7525 SUSSEX AVENUE St. Louis 17, Mo.

EXPORT DEPT. AD AURIEMA INC., 89 BROAD STREET, NEW YORK 4, N. Y.

Florida motel orders "seconds" on Worthington air conditioning



Low-cost operation of Worthington packaged liquid chillers stems from exact matching of capacity control to load requirement. Easy installation, long life and wide selection are other key features.

Providing an attractive climate indoors and out has paid off so well for the Azure Tides Motel that they're adding a second building.

The cool, comfortable indoor climate is provided by Worthington's 25-ton packaged chiller (at left) and 15-ton condensing unit. So sold on Worthington air conditioning are the Azure Tides people that the new structure will be cooled by a second Worthington central system consisting of a 25-ton package chiller and a 15-ton condensing unit.

Located on Sarasota's Lido Beach, this handsome two-story motel owes its growing popularity to a choice location, modern comfortable appointments and service geared to the guests' convenience.

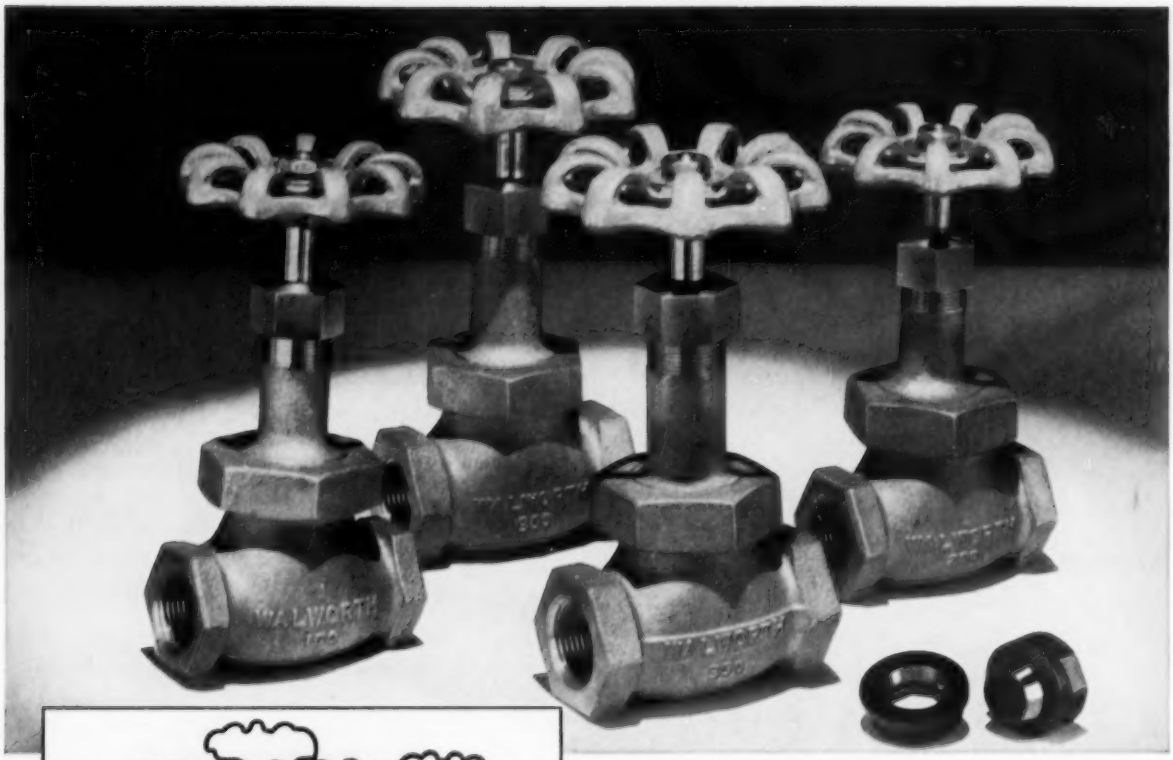
Both the original 50-unit building (above) and the 38-unit addition (three-story construction with elevator, modern restaurant and cocktail lounge) were blueprinted by Designer Frank C. Martin and built by General Contractor Charles Ongheri of Sarasota.

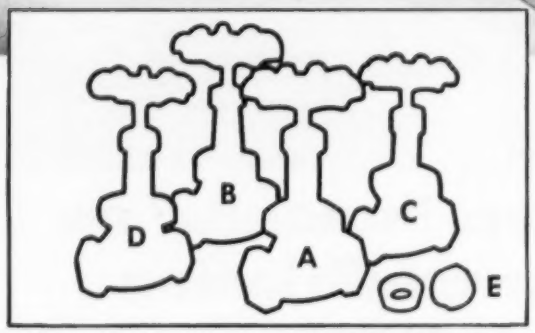
For information on air conditioning units to meet your residential, business or industrial needs, call your local Worthington distributor. Or write for Bulletin WP-1099 B48 to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.6.70-R, Harrison, New Jersey.

A.6.70

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME





A — No. 225P.....350 WSP 550F, 1000 WOG
B — No. 260P.....300 WSP 550F, 600 WOG
C — No. 245P.....200 WSP 550F, 400 WOG
D — No. 237P.....150 WSP 500F, 300 WOG
E — "500 Brinell" Stainless Steel Plug Type Seat and Disc

Walworth offers four lines of Bronze Globe Valves with stainless steel, plug-type seats and discs. Advantages of these valves include:

• **Stainless Steel Plug-Type Seats and Discs,** heat-treated to a minimum of 500 Brinell hardness reduces wire-drawing to a minimum. Seats and Discs are machined and fitted simultaneously, assuring perfect mating.

• **Deep Stuffing Boxes with Glands** are fitted with reinforced, molded packing. Valves can be repacked under pressure when fully opened.

For Longer Bronze Valve Life . . .

"500 BRINELL" PLUG-TYPE STAINLESS STEEL SEATS AND DISCS

150 lb. 200 lb. 300 lb. 350 lb.

• **Oversize Stems,** made of high tensile strength silicon-bronze, assure long life.

• **Rugged Body Hexes,** are flat on top; do not interfere with wrench gripping body-to-bonnet union ring connection.

• **Bodies,** made of Composition M bronze (ASTM B61), have ample wall thickness to provide high safety factor.

• **Patented Handwheels** are air-cooled and designed with a "finger-fit grip." Makes turning easy even when wearing greasy gloves.

• **Identification Plates** secured by lock-washer under stem nut, show Figure Number of valves and make re-ordering sure and easy.

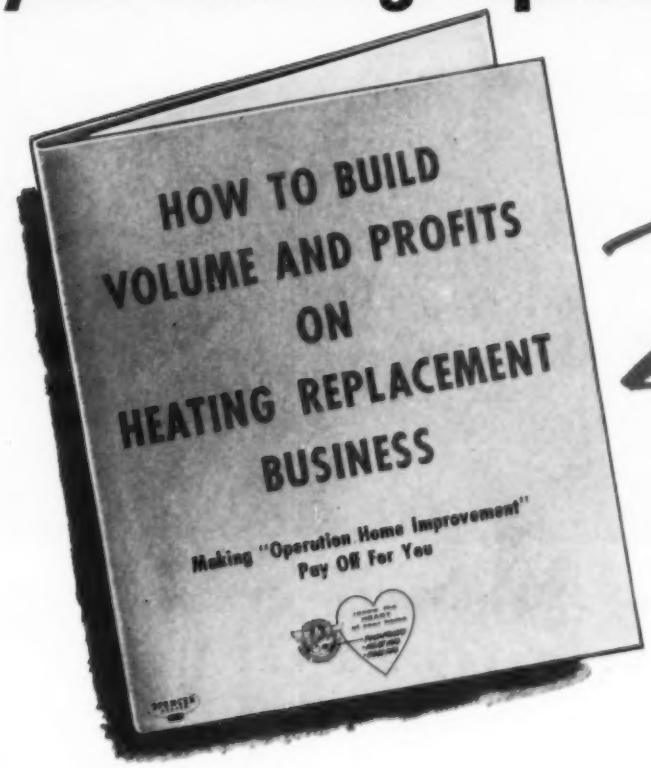
FOR COMPLETE INFORMATION, SEE YOUR WALWORTH DISTRIBUTOR OR WRITE FOR ILLUSTRATED CIRCULAR

WALWORTH

60 East 42nd Street, New York 17, New York

SUBSIDIARIES: ALOYCO ALLOY STEEL PRODUCTS CO. CONOFLOW CORPORATION M&H M & H VALVE & FITTINGS CO.
SW SOUTHWEST FABRICATING & WELDING CO., INC. W WALWORTH COMPANY OF CANADA, LTD.

NOW... a plan to boost your heating replacement business this summer



FREE

Write now for this new, practical, step-by-step program that can mean increased volume and more profits *for you!*

A practical working plan

This *free* Kit takes you through each step involved in setting up a practical program—shows you how to go about getting heating plant replacement business, and more profit dollars. Included in it are some of the "tools" you'll need to get the program underway.

Answers questions like these:

1. Who are my logical prospects and how can I reach them?
2. How can I alert my own service men to replacement business possibilities?
3. What's the best way to approach my prospects?
4. How can I overcome the prospect's resistance to "having it done now"?
5. What are the two sure-fire keys to closing the sale?

MAIL THE COUPON TODAY!

There's no cost or obligation. Organize now to increase your heating replacement sales this Summer.

SPENCER HEATER

AVCO

SBI

Spencer Heater, Lycoming Div.,
Avco Mfg. Corp., Williamsport, Pa.

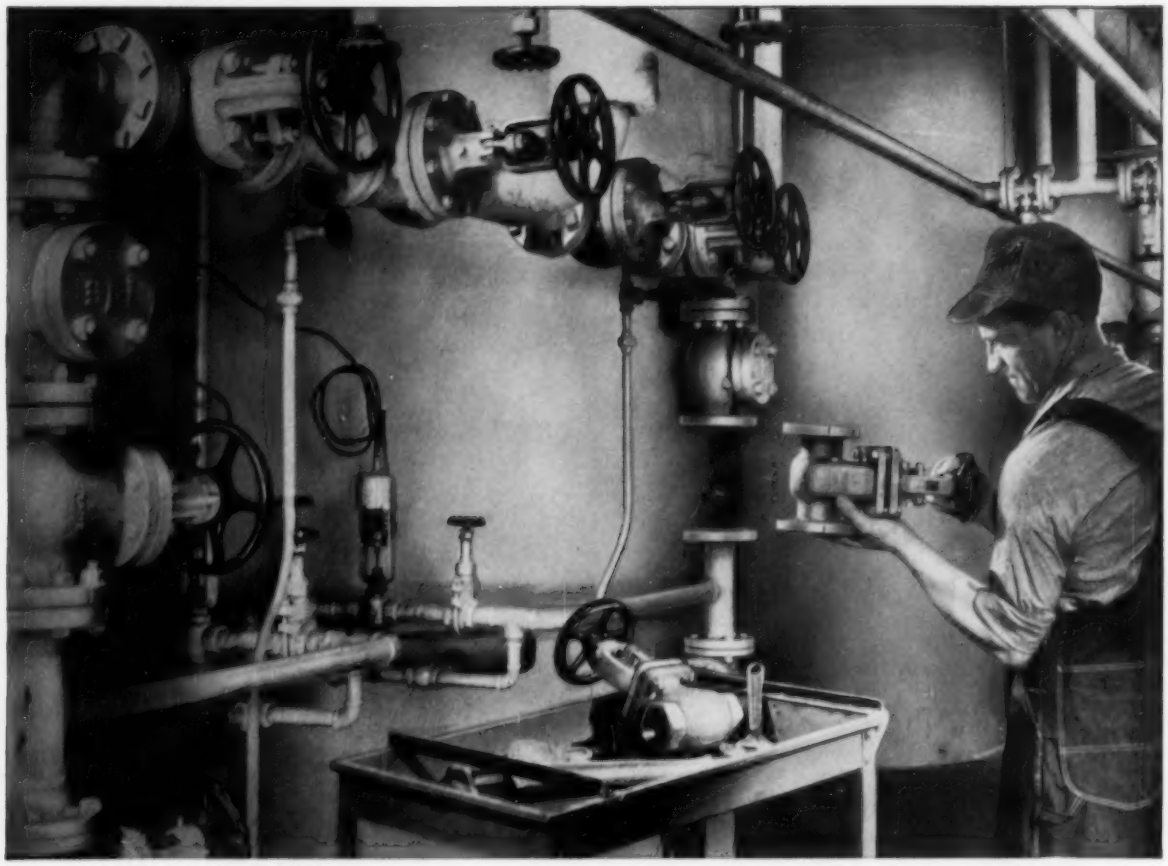
Gentlemen:
Please send me your *free* Kit "How to Build Volume and Profits on Heating Replacement Business."

My Name_____

Name of Company_____

Street_____

City_____ State_____



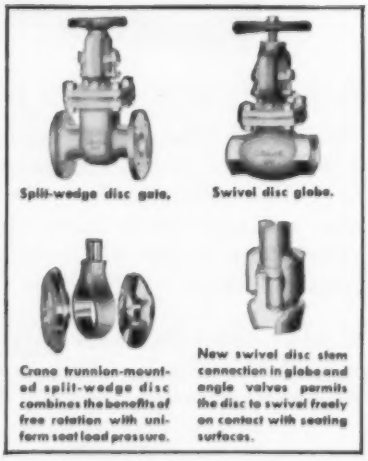
Corrosion meets match in Crane 18-8 SMo and Craneloy 20 valves

It's unanimous! These Crane valves for the process industries were *especially designed* of Crane alloys to cope with costly corrosion and to cut replacement costs.

The gate valves feature a simple, split-wedge disc construction which permits discs to rotate freely within guides and to seat tightly at all points on the seat perimeter. The free movement of the disc, plus uniform seating and unseating loads, minimizes galling and seizing, reduces wear and allows smooth operation under all conditions.

Globe and angle valves now feature a modified plug-type disc that combines the advantages of the easier seating of the narrow ball-to-flat seat and the high resistance of the wider plug-type disc to corrosion, erosion and cutting. In addition, these valves offer a new swivel disc-stem connection that seats the disc squarely every time. Minimum clearance eliminates vibration.

These valves are available in 18-8 SMo and Craneloy 20 . . . in gate, globe, angle and check patterns . . . ½" to 6" . . . screwed or flanged ends. Rated 150 p.s.i. at 500° F.—230 p.s.i. at 100° F. *For more detailed information*, confer with your CRANE representative or write to the address below for the 12-page circular AD-2080.



Split-wedge disc gate.

Swivel disc globe.

Crane trunnion-mounted split-wedge disc combines the benefits of free rotation with uniform seat load pressure.

New swivel disc stem connection in globe and angle valves permits the disc to swivel freely on contact with seating surfaces.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

WILBERT SNOW ELEMENTARY SCHOOL

MIDDLETOWN, CONNECTICUT

Architect: **WARREN H. ASHLEY**, West Hartford, Conn.
Mechanical Engineers: **MARCHANT and MINGES**, W. Hartford
Heating Contractor: **K. R. GRAHAM**, Hartford, Conn.

One of 2 Powers controlled top-award schools in SCHOOL EXECUTIVE 1956 Competition.

Another AWARD WINNING SCHOOL with POWERS

Temperature Control System For Heating and Ventilating

Here's a unique school retaining the natural beauty of its wooded site. It also serves the adult community.

It has 20 classrooms, 4 in each of five buildings. Ideal temperature and proper ventilation for effective teaching and learning is obtained by a Powers thermostat in each room. It controls a mixing damper at the forced warm air furnace type unit. Each classroom building has two such units.

In the main building, the cafeteria, library and auditorium are served by heating and ventilating fan units. Similar units serve the gym. Administration areas, shower and locker areas are served by multizone heating and ventilating units. A central boiler plant provides steam for heating and ventilating units in all areas except classrooms.

Are You Planning a New School or modernizing an old one? Ask your architect or engineer to include a Powers Quality system of temperature control. They've been time-proved dependable in thousands of schools since 1891. You will insure comfort and fuel savings at lowest upkeep cost.

For further information contact our nearest office

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico See your phone book*

65 years of Automatic Temperature and Humidity Control

(c73)

YOURS FREE!

You Get This JUG-A-LUG with your July purchase of genetron® from your WHOLESALER

Helpful! Easy-to-Use!

Here's something every service engineer needs . . . and your "Genetron" wholesaler will give you a JUG-A-LUG *Absolutely Free* with the purchase of a 25-lb. cylinder of "Genetron" during the month of July.

This all-steel JUG-A-LUG carrier makes handling of 25-lb. cylinders a snap. Just screw it on the cylinder threads and carry the "Jug" away. No more awkward wrestling with cylinders . . . no more scraped and strained fingers.

At least a $1.50 value, the "Genetron" JUG-A-LUG comes with the manufacturer's life-time guarantee not to warp, crack, bend or break. Fits 10-lb. as well as 25-lb. cylinders.

● **Now, during JULY ONLY,** your "Genetron" wholesaler can offer *one JUG-A-LUG free to a customer* . . . with your purchase of a 25-lb. cylinder of "Genetron" Super-Dry Refrigerant.

That's all there is to it. Just buy a 25-lb. "Genetron" Cylinder from your wholesaler the same as usual during July . . . and get your sturdy, useful JUG-A-LUG FREE!

SUPPLIES ARE LIMITED!

See your "Genetron" wholesaler early . . . and be sure to get your JUG-A-LUG while he has them on hand.

genetron

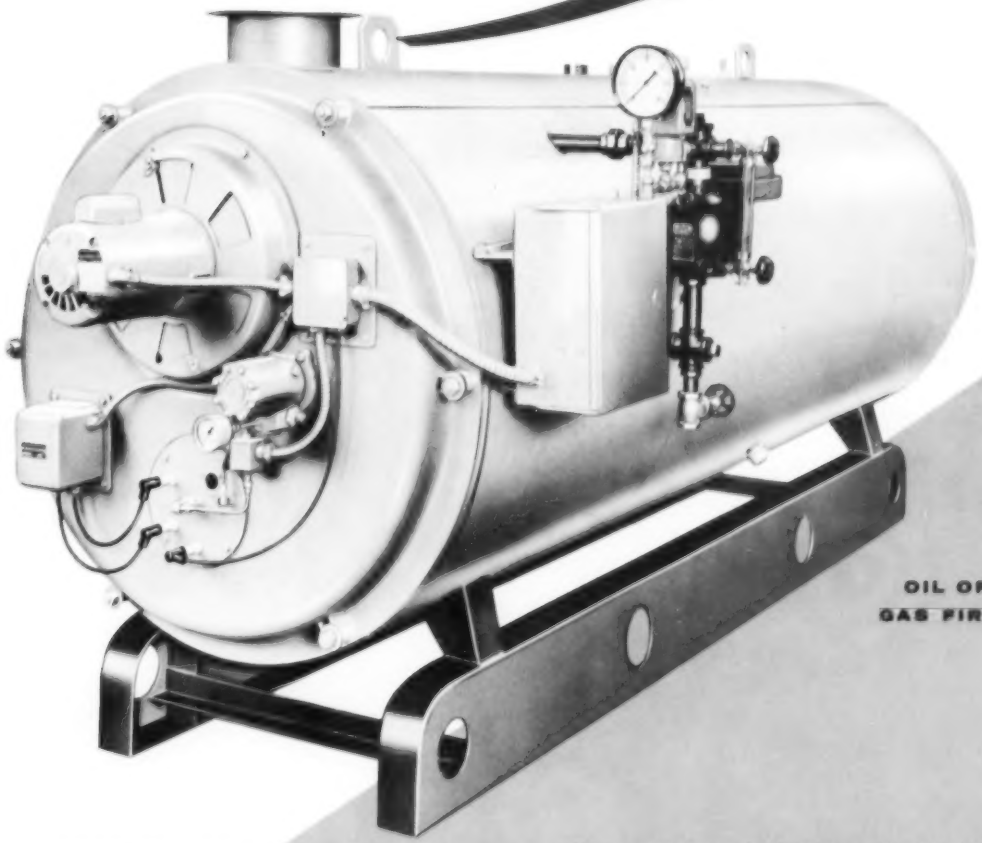
GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
Offices in Principal Cities

It's the BIG NEWS In Commercial Heating

Presenting.....Cleaver-Brooks

Progress

Packaged Boiler



OIL OR GAS FIRED

A PRODUCT OF

CLEAVER-BROOKS COMPANY

- **A *COMPLETE* BOILER PACKAGE** — from one company, one source. Factory-assembled, tested and shipped as a fully self-contained unit.
- **FIELD STARTING SERVICE** — final check and adjustment by authorized service representative, after installation, plus operator training — at no extra cost.
- **A *QUALITY* PRODUCT** — the first boiler of its class built to quality standards of costly industrial boilers: forced-draft, four-pass design . . . electronic controls . . . guaranteed 80% efficiency.
- **SIZES UP TO 1,340,000 BTU PER HOUR** — for commercial — industrial steam and hot water.

TURN PAGE FOR MORE FACTS WHICH POINT UP PROGRESS BOILER VALUES

Simplifies planning and purchase . . . installs anywhere guaranteed 80% efficiency

Saves boiler-planning time — Architects and engineers will be quick to recognize the advantages of compact, space-saving PROGRESS Boiler design — and the merits of a complete boiler package from one company, one dependable source.

Time-saving installation — Every PROGRESS Boiler is a complete package — boiler, burner, controls, insulation. Shipped ready for installation and requiring only service connections. No waiting for parts or other costly delays for owners.

Tuned to perfection — Authorized factory servicemen start boiler and train operator. Heating contractors know how much this contributes to a properly adjusted, smooth-running boiler with peak efficiency *assured* at the outset.

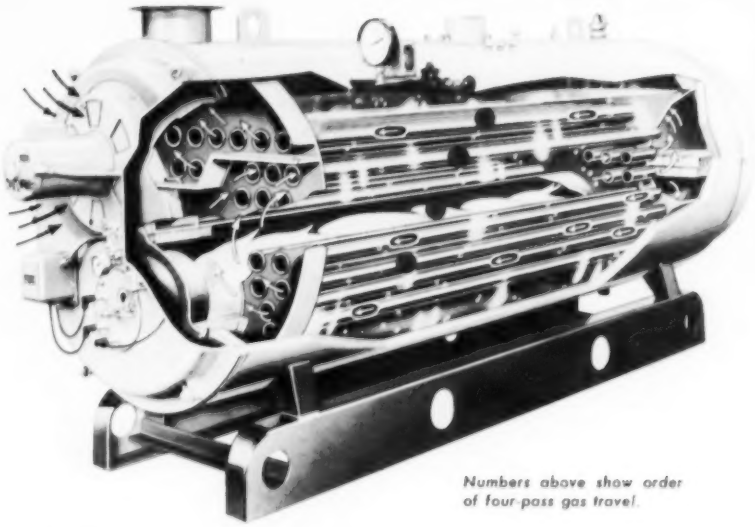
SOFT-FLAME START— clean-burning, quiet operation

Electric ignition assures smooth, noiseless light-off of main flame. Pressure atomizing type burner is approved for commercial No. 2 light oil.

Gas fired models have multiple jet, high radiant type burner for use with natural, manufactured, and mixed gases

Four-pass design with forced draft is the most efficient combination to transmit greatest percentage of heat to boiler water. Quiet-running *blower* supplies combustion air — eliminates need for expensive chimney.

Electronic combustion-safety control assures safe shut-down. Operating controls are all nationally known, quality products.



Numbers above show order of four-pass gas travel.

in step with PROGRESS . . . way ahead in design

PROGRESS boilers are built to quality standards of industrial boilers — in one of America's most progressive manufacturing plants, under strict quality control. The complete boiler unit is approved and bears the Underwriters' label.

Note the integrated construction with all controls centralized for most efficient operation and easy accessibility. Unit painted a handsome green color.

Front and rear tube sheets are fully accessible for inspection and cleaning. Base frame sets solidly on any floor. Lifting rings assure easy overhead handling, or unit may be skidded into position.

Cleaver-Brooks
Progress
Packaged Boiler

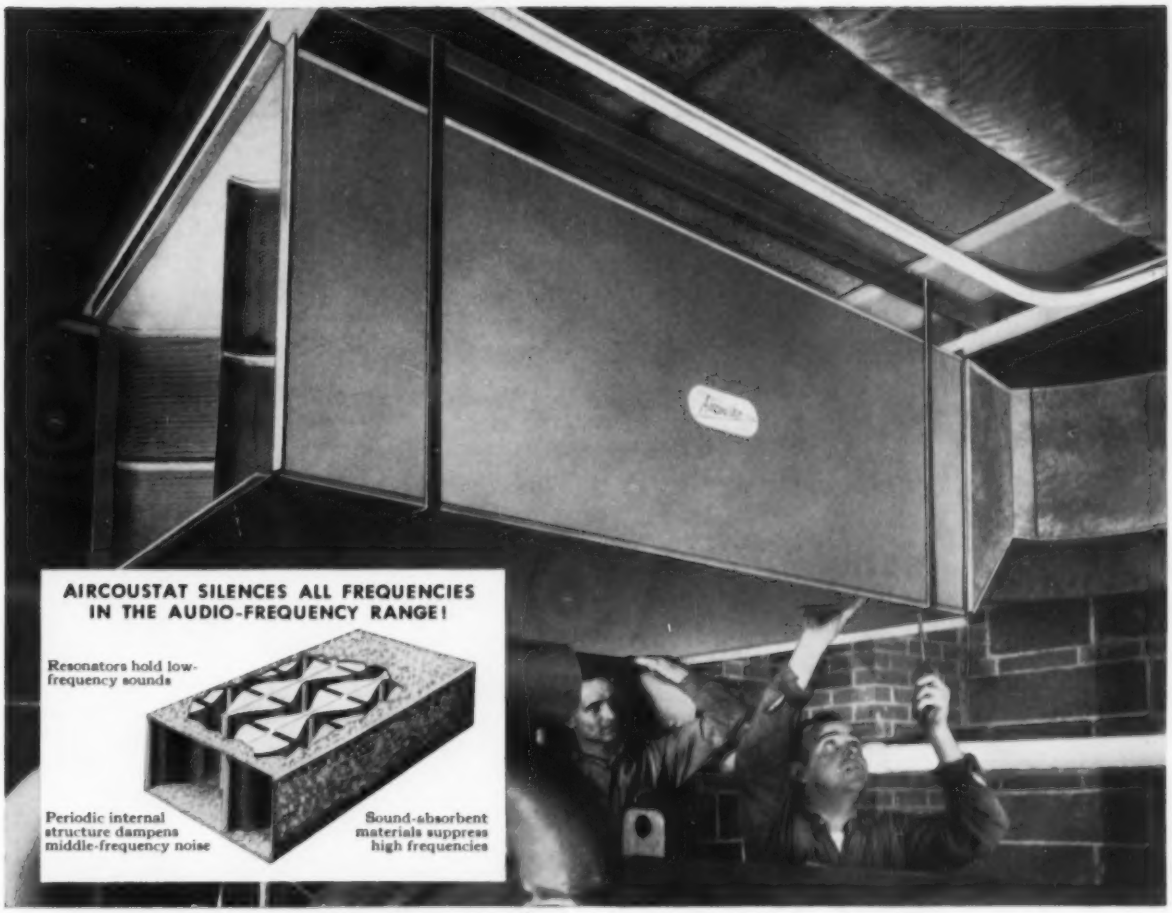
PROGRESS Boilers are products of Cleaver-Brooks Company, recognized leader in the packaged boiler industry

Designed and built in its entirety by Cleaver-Brooks, the PROGRESS Boiler is backed by a single, responsible company, with an experience record of more than 20,000 industrial and commercial boilers.

FOR FULL DETAILS ON AMERICA'S MOST MODERN commercial BOILER — FOR STEAM OR HOT WATER HEATING — WRITE FOR CATALOG AD-157.

CLEAVER-BROOKS COMPANY
326 East Keefe Avenue, Milwaukee 12, Wisconsin
Cable Address: CLEBRO — Milwaukee — all codes

Form No. AD-156 Printed in U.S.A.


AIRCOUSTAT SILENCES ALL FREQUENCIES IN THE AUDIO-FREQUENCY RANGE!
Resonators hold low-frequency sounds
Periodic internal structure dampens middle-frequency noise
Sound-absorbent materials suppress high frequencies

AIRCOUSTAT* Sound Traps eliminate air conditioning noise at 50% less cost

Acoustical Performance Guaranteed. Easy to Install. Pre-Engineered — No Design or Layout Headaches.

Revolutionary AIRCOUSTAT Sound Traps require no special tools for installation ... reduce your labor costs and lower your installation time. Units fit any size or shape of duct. If AIRCOUSTAT fits *geometrically*, it fits *acoustically*.

AIRCOUSTAT is the most efficient method of sound-deadening you can provide your customers. A 7-foot AIRCOUSTAT unit suppresses as much sound as 100 feet of ordinary duct lining. AIRCOUSTAT eliminates all frequencies in the entire audio-frequency range, silences entire systems or selected outlets. Flow resistance and pressure drop are lower. 4 series cover applications ranging from general offices to recording studios.

Discover how AIRCOUSTAT Sound Traps can save you time and money . . . create greater customer satisfaction.

*Koppers Trade Mark

KOPPERS **INDUSTRIAL SOUND CONTROL**

Engineered* Products Sold with *Service

MAIL THIS COUPON TODAY

KOPPERS COMPANY, INC., Metal Products Div., Industrial Sound Control Dept., 6207 Scott St., Baltimore 3, Md.
Gentlemen: Please send me a free copy of your booklet on AIRCOUSTAT Sound Traps.

Name..... Title.....

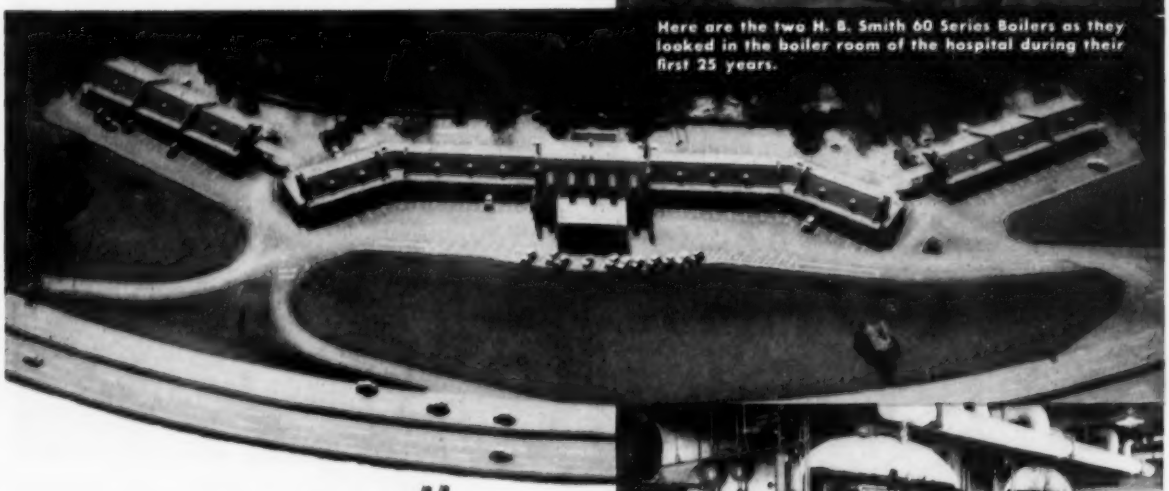
Company.....

Address.....

City..... Zone..... State.....

After 25 years in a hospital—

Here are the two H. B. Smith 60 Series Boilers as they looked in the boiler room of the hospital during their first 25 years.



They look well, don't they!

Motorists who get around agree that the Framingham Motor Inn at Framingham, Massachusetts, is one of the finest and most modern motor courts in the country.

It isn't surprising that the heat and hot water for this 102-unit paragon of repose are supplied by two H. B. Smith boilers. Nor is it surprising *to those who know boilers* that the two boilers selected for the installation *already had served for a quarter-century in a Rhode Island hospital!*

After 25 years of day and night service, conventional boilers would be ready for retirement . . . but H. B. Smith boilers are still going strong. This is because they have vertical cast iron water tubes which are an integral part of the boiler, and are highly resistant to fuel acids and feedwater impurities.

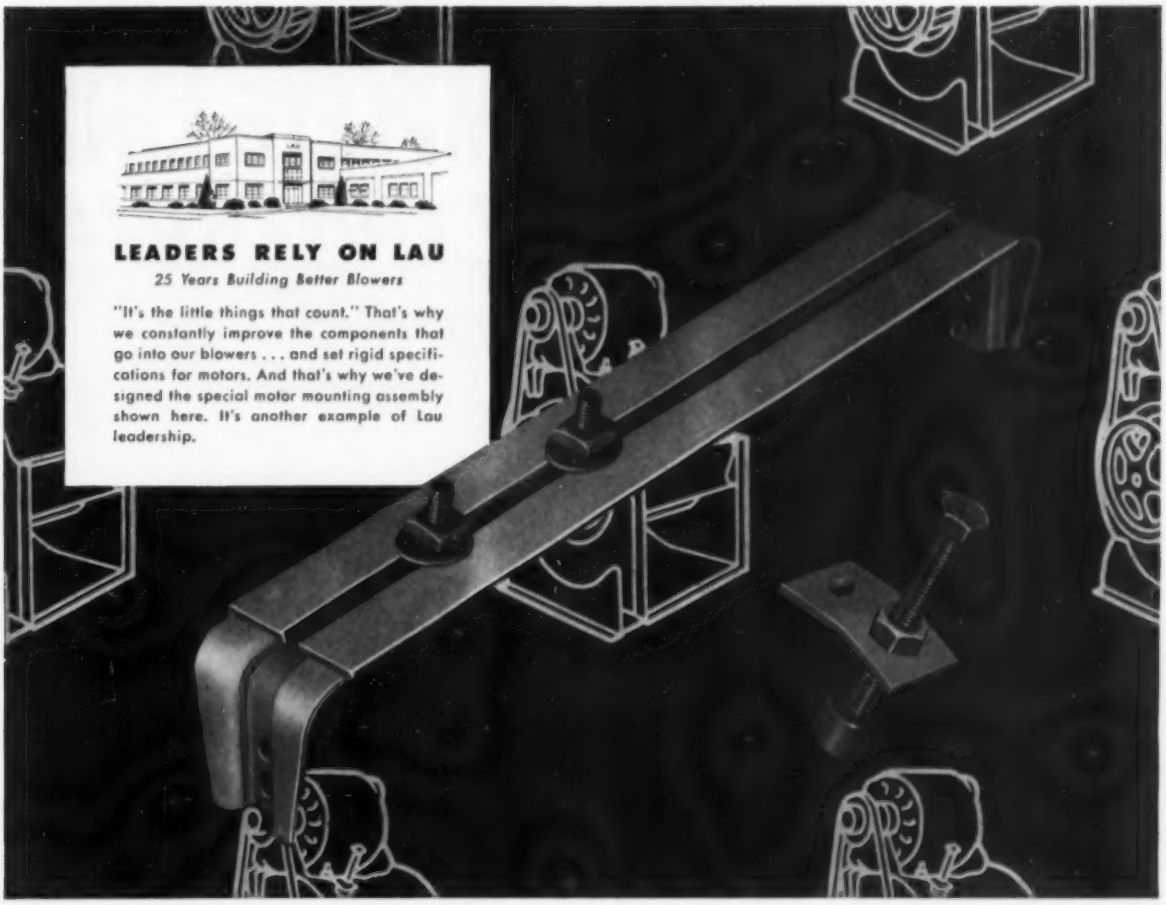
Here are the two H. B. Smith 60 Series Boilers as they look today in the boiler room at Framingham Motor Inn.

H. B. Smith boilers respond quickly, and maintain high efficiency with minimum attention. Maintenance costs are negligible and new sections can be added to provide greater heating capacity as a building is expanded.

Framingham Motor Inn can look forward to another quarter century of service from these boilers. After all — they've had *experience!*

H.B. Smith **CAST IRON BOILERS**

H. B. SMITH CO., INC., WESTFIELD, MASSACHUSETTS • *Established 1853*



LEADERS RELY ON LAU

25 Years Building Better Blowers

"It's the little things that count." That's why we constantly improve the components that go into our blowers . . . and set rigid specifications for motors. And that's why we've designed the special motor mounting assembly shown here. It's another example of Lau leadership.

MUSCULAR MOTOR MOUNTING

This Exclusive Lau-developed Motor Mounting Bracket and assembly is a heavyweight champion. The metal is of double-thickness for brute strength (it is, in fact, *stronger* than the bolts that hold it in position). And it is the most flexible mounting ever built . . . with a patented feature of complete adjustability for mounting motor clockwise or counter-clockwise without removing the mounting. Two holes are provided in the ends for additional center-distance adjustments between blower and motor shaft, and motor with mounting bolts can be adjusted laterally in an infinite number of positions for any motor. The tailpiece assembly, designed by Lau, has been accepted by the industry as the method to use for maximum belt-tension adjustment and is provided with a rubber insulator. You can depend on LAU for quality. Write Dept. M today.

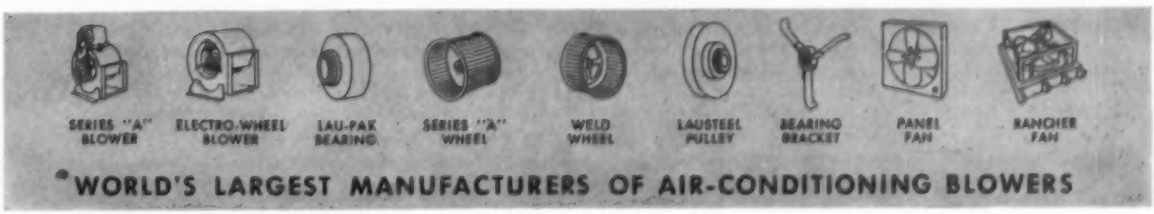
25 ANNIVERSARY LAU

THE LAU BLOWER COMPANY

2000 Home Ave. • DAYTON 7, OHIO

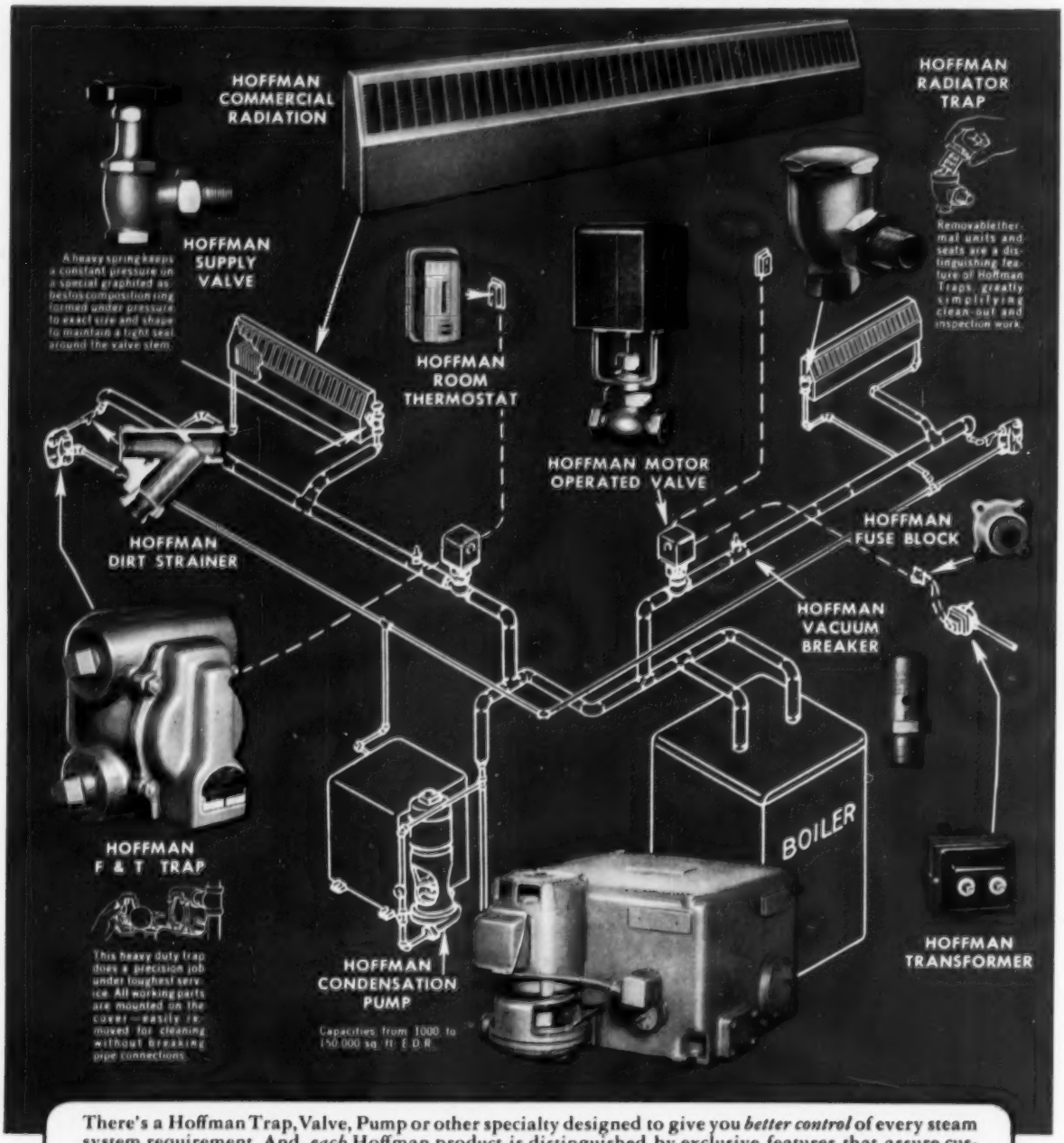
Other plants at Kitchener, Ont., Canada, and Azusa, California

LB-7, 56



WORLD'S LARGEST MANUFACTURERS OF AIR-CONDITIONING BLOWERS

HOFFMAN COMPLETE LINE OF *STEAM SYSTEM CONTROLS*


HOFFMAN COMMERCIAL RADIATION
HOFFMAN RADIATOR TRAP
Removable thermostatic units and seats are a distinguishing feature of Hoffman Traps, greatly simplifying clean-out and inspection work.
A heavy spring keeps a constant pressure on a special graphited asbestos composition ring formed under pressure to exact size and shape to maintain a tight seal around the valve stem.
HOFFMAN SUPPLY VALVE
HOFFMAN ROOM THERMOSTAT
HOFFMAN MOTOR OPERATED VALVE
HOFFMAN DIRT STRAINER
HOFFMAN FUSE BLOCK
HOFFMAN VACUUM BREAKER
BOILER
HOFFMAN F & T TRAP
This heavy duty trap does a precision job under toughest service. All working parts are mounted on the cover—easily removed for cleaning without breaking pipe connections.
HOFFMAN CONDENSATION PUMP
Capacities from 1000 to 150,000 sq. ft. E.D.R.
HOFFMAN TRANSFORMER

There's a Hoffman Trap, Valve, Pump or other specialty designed to give you *better control* of every steam system requirement. And, *each* Hoffman product is distinguished by exclusive features that assure customer satisfaction, long, care-free service. *It's the* COMPLETE, *tested, quality line* backed by a dependable, single source of supply and responsibility. *Yet Hoffman Products cost no more than the ordinary kind—and pay their way with the fuel they save.* To avoid delays—order now from your wholesaler of heating and plumbing supplies. Catalogs available on all items.

HOFFMAN SPECIALTY MFG. CORP. • 1700 West 10th Street, Indianapolis 7, Indiana

Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps. Sold by Leading Wholesalers of Heating and Plumbing Equipment

UNIFORM THREADING OF YOUNGSTOWN PIPE

makes your job easier, quicker

. . . yet more efficient

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

Pipe fitting can be trouble free when threads are perfect. Couplings, tees, elbows roll on smoothly with no effort, tighten up with leakproof sureness. There aren't any stoppages or delays--no rattled nerves, no skinned knuckles, no recut threads. You've a quality job and satisfied customer.

You'll appreciate the uniform threading point of goodness -- like the other 6 points of uniform goodness -- in Youngstown Pipe. That's why it will pay you to specify Youngstown for all your pipe needs.

Youngstown PIPE

QUALITY YOUNGSTOWN SERVICE

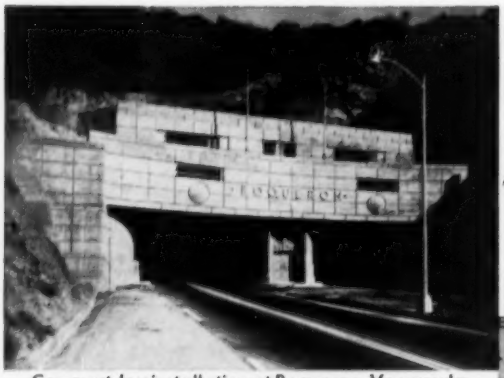
THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

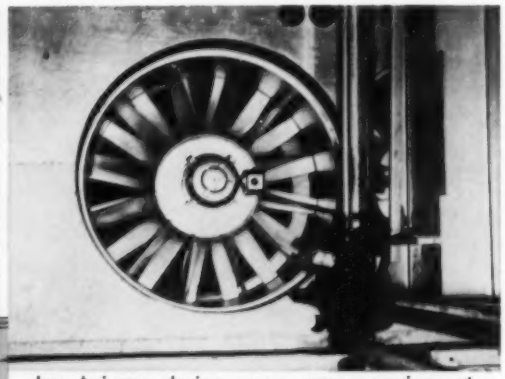
General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

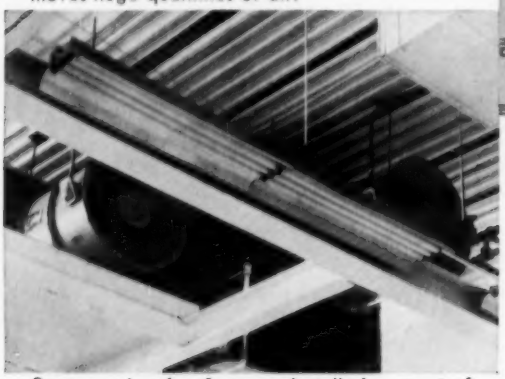
Ventilation Problems: Gone with the Joy Axivane Wind



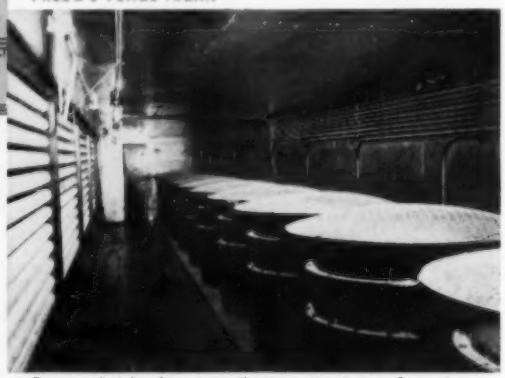
Compact Joy installation at Boqueron, Venezuela, moves huge quantities of air.



Joy Axivane design means power savings at Alcoa's Texas Plant.



Space-saving Joy fans are installed as part of the duct system at Reliance Electric's Ohio Plant.



Dependable Joy installation circulates freezing air in California Cold Storage Plant.

'Round the World, JOY Handles the Hard Ventilating Jobs

Joy handles the hard jobs in ventilation round the world because a Joy fan develops greater volume of air per pound of fan and motor—because of simplicity of installation that eliminates duct offsets, elbows, drives and guards. The JOY Axivane fan is a favorite of ventilating engineers because JOY installations save up to 70% of the space occupied by other fans of equivalent performance. This space-saving feature of Joy fans makes possible more profit-making production area.

An Axivane fan is an integral part of the duct in which it is installed. Pre-lubricated, double-shielded ball bearings permit the fan to be installed in any position—give you long service without attention. These precision air-moving machines are marvels of efficiency and compactness. They provide economical, efficient air circulation for all types of commercial and industrial applications.

You can choose from a standard line of over 136 models specially designed to meet the needs of modern industry. The Joy Axivane Series 1000 is a standard line available to you ready for installation.

For complete information about the JOY standard line of 136 models—to learn about JOY custom engineering service, write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*

Write for FREE Bulletin 17-41

Consult a Joy Engineer

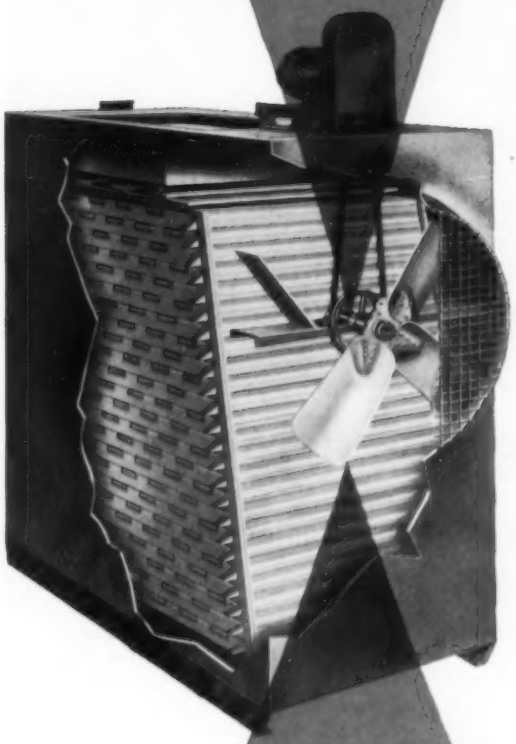
JOY

WORLD'S LARGEST MANUFACTURER OF VANEAXIAL-TYPE FANS

W&D 10840-17

So Halstead & Mitchell engineers said:

'THIS HAS A BEARING ON COOLING TOWER PERFORMANCE'



Nothing has more bearing on cooling tower performance and life than do tower fan bearings. On them turn the induced draft cooling tower's *only moving parts.*

Announcement by Halstead & Mitchell engineers of a *permanently* sealed and lubricated fan bearing means a bearing so designed as to completely eliminate moisture—and consequent rusting of the bearing balls and races. The *elimination of periodic greasing* cuts your tower maintenance costs to an absolute minimum . . . literally adds years to cooling tower life.

With not a single bearing failure reported from the hundreds of these "new bearing" towers in actual use, Halstead & Mitchell offers you . . . now more than ever . . . the best buy in cooling towers on the market today

SUPER-QUIET, 4-BLADE FANS, TOO!

There are new fans, too, on Halstead & Mitchell Cooling Towers—deep-pitch fans which operate at much, much lower speeds—actually *cut cooling tower noise level in half.* Sturdy, stainless steel fan blades . . . stainless steel fan shafts . . . make sure your tower will have not only a quiet life, but a long one, too!

For Complete Details, Write for Bulletin CT-584

20-Year Guarantee!

on the wetted deck surface against rotting or fungus attack is an extra given you only by Halstead & Mitchell. Combined with the H & M *Protected* Steel concept, it offers unsurpassed protection against water and weather.

H & M COOLING TOWERS ARE AT LEADING WHOLESALERS EVERYWHERE

HM

Halstead & Mitchell

BESSEMER BUILDING, PITTSBURGH 22, PA.

New Bearing available 5 thru 50 Tons

Here's a red-hot sales lead for you!

Take your customers out of this picture with snow-melting systems installed with Spang Steel Pipe

Don't let your customers get stuck like this next January. Sell them on savings and safety with a snow-melting installation using SPANG CW Steel Pipe. You benefit, because you make the sale. Your customers benefit for a number of reasons . . . like these:

CUTS COSTS . . . SAVES TIME. —A SPANG Steel Pipe snow-melting system fed by a small hot water boiler, is easily installed by means of a network of SPANG Steel Pipes under sidewalks or road paving. It requires practically no maintenance, melts snow at the rate of one inch per hour, and eliminates the expense of salt and chemicals, snow-removal equipment and manual labor. Walks, drives, loading docks are kept open all year around.

SAFER . . . MORE PROFITABLE. —It stops the danger of falls and the chances of accidents from straining or overexertion by snow removal personnel. It builds good will among employees, tenants and customers. There's "business as usual" regardless of weather.

START SELLING NOW! —This is the best time of year to install snow-melting systems, and *top-quality* SPANG CW Steel Pipe is your best choice of material. This *quality-controlled* product will give years of excellent service in any snow-melting installation.

Your town is full of good prospects, so plan your sales campaign today! Your nearby SPANG Distributor is ready to be of service to you. The next move is up to you!

P. S.—If you want more information, write us for a free copy of the booklet "Steel Pipe Snow-Melting Systems."

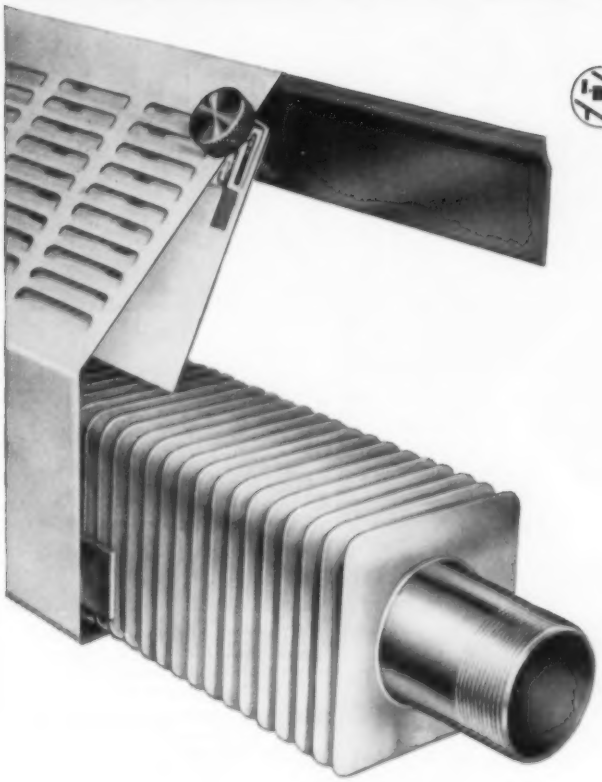
SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York Philadelphia, Pittsburgh, St. Louis

SPANG CW STEEL PIPE

SARCOFIN

When you buy or specify radiation

make sure you get all these advantages!



Sarcofin offers you:

APPROVED RATINGS—as established by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

FULL GUARANTEE—top-quality Sarcofin products, backed up by a *1-year guarantee* against defects in materials and workmanship. Heating elements *guaranteed* for maximum working pressures.

COOPERATION—careful selection of radiation by experienced Sarco and Sarcotherm heating engineers.

UNDIVIDED RESPONSIBILITY—the protection and convenience assured by obtaining from *one* "Complete Line" source...SARCO-SARCOTHERM... not only Sarcofin finned-tube and baseboard radiation but also heating specialties for steam and hot water, condensation and vacuum pumps, temperature regulators, and weather-compensated control systems for steam and hot water heating.

SARCO COMPANY, INC.
SARCOTHERM CONTROLS, INC.
Empire State Building, New York 1, N. Y.

MAIL COUPON FOR THESE BULLETINS

Sarco Company, Inc.—Sarcotherm Controls, Inc.
Empire State Building, New York 1, N. Y.

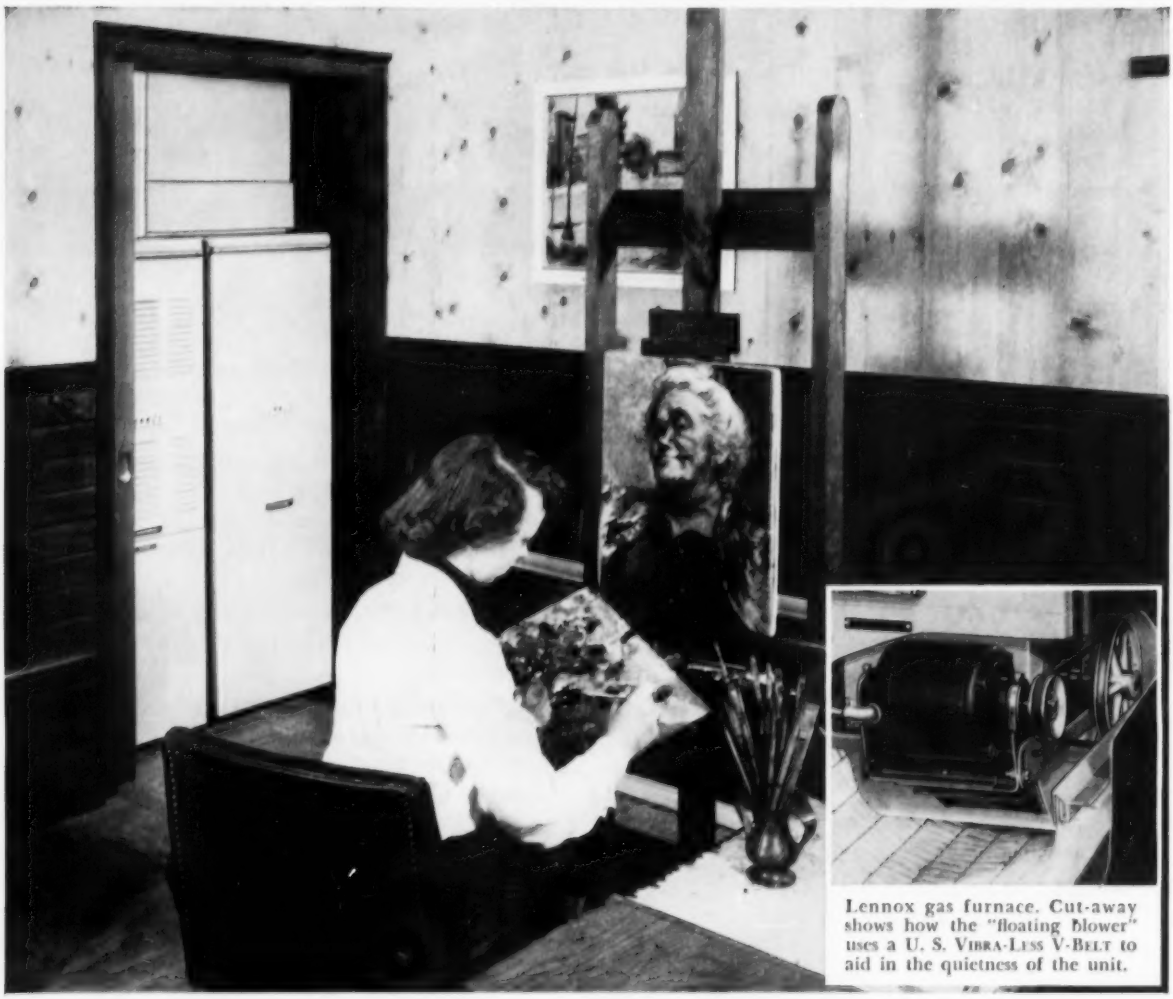
Please send me:
☐ 32 page Bulletin No. 1650 on Sarcofin Finned-Tube Radiation.
☐ Bulletin No. 1625 on Sarcofin Baseboard Radiation.
☐ Also information on _____

NAME _____
FIRM _____
ADDRESS _____
CITY _____ STATE _____

2125-B

Vibra-Less V-Belts

selected by Lennox engineers for quiet operation



Lennox gas furnace. Cut-away shows how the "floating blower" uses a U. S. VIBRA-LESS V-BELT to aid in the quietness of the unit.

In the Lennox gas furnace, all vibrations are stopped dead. And because vibrations cannot possibly travel on, there's no chance of noise or rattle, not even a whisper.

The U. S. VIBRA-LESS V-BELT is a big reason.

This belt has two exclusive "U. S." developments—Electronic Tension and a new kind of molding process.

With the Electronic Tension technique each cord in the belt is built in by error-proof electronics, instead of by mechanical means. This guarantees every cord will pull its full share of the load. Belt life is prolonged.

The new molding method provides a smooth contact jacket without high spots or surface imperfections . . . making U. S. VIBRA-LESS V-BELTS ideal for appliances and high-precision machinery. It also gives U. S. VIBRA-LESS V-BELTS outstanding resistance to wear, grime and moisture penetration.

Additional information on the U. S. VIBRA-LESS V-BELT may be obtained from any of the 28 "U. S." Sales Offices or from any of the select "U. S." Distributors. Or contact us at Rockefeller Center, New York 20, N. Y.

Mechanical Goods Division

United States Rubber

Now available—for you!

VALUABLE NEW BOOK

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INDUSTRIAL QUALITY... FRACTIONAL H.P. ELECTRIC MOTORS

Right at your desk, make a detailed inspection of Century's Fractional H.P. single phase and polyphase line of motors, designed to latest NEMA standards! This fact-filled new book gives you the comprehensive story on Century's *new* 48-Frame and 56-Frame INDUSTRIAL QUALITY Motors... tells how and why they're *better performers* than the older models, why they weigh less, take less space, are easier to handle.

Motor types and mountings are described, stator and rotor construction, how to select proper torque and speed... and many other facts to help you choose the right motors for *top performance*... all along the line!

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Please send New Bulletin 1-IPI to:

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Performance-Rated© MOTORS
1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

62

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

Sand and Ground Glass Solution

60 feet straight up

with dependable De Laval CPO Pumps

These De Laval CPO Pumps are at work 24 hours a day, 7 days a week

Here's proof of the dependability of De Laval CPO Pumps. In one large automotive company, glass grinders work 24 hours a day, 7 days a week virtually every week in the year. They cannot grind without the sand and ground glass polishing compound which must be pumped 60 feet straight up and over to a grinding room. Says the supervisor, "We have encountered no trouble at all, nor has there been any downtime for the grinders due to the pumping operation."

These pumps have cast iron casings with De Laval KK-20 (20-28 stainless) internals. This superior metal is also being used successfully on other problem fluids which require KK-20 for the casing as well.

Three bearing pedestals accommodate nine wet end sizes of the De Laval CPO, and changes in size or metallurgy can be made *after* installation with off-the-shelf parts. Either conventional or mechanical seals are available.

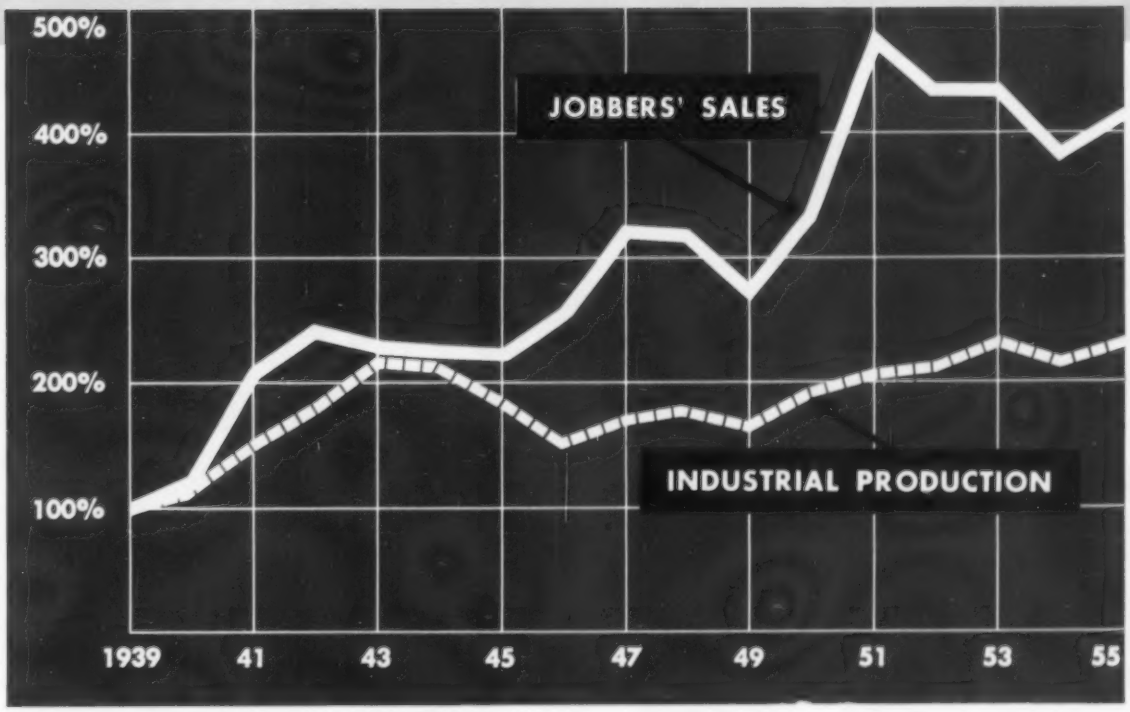
Write for Bulletin 1125-B

DE LAVAL *CPO Process Pumps*

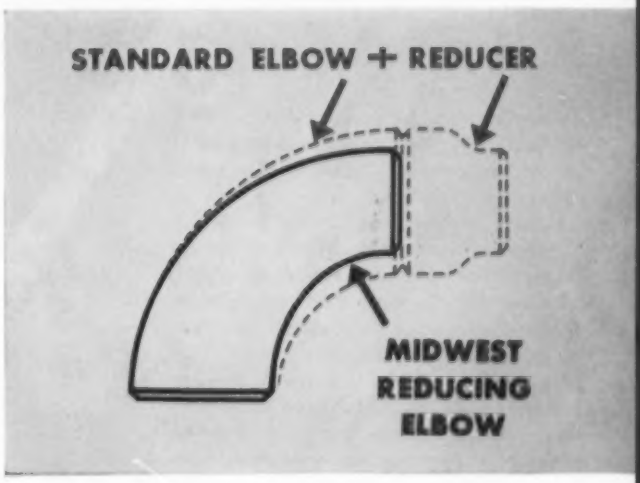
DE LAVAL STEAM TURBINE COMPANY
871 Nottingham Way, Trenton 2, New Jersey

DL 2-3

JOBBERS Prevent Hardening of the ECONOMIC ARTERIES



The chart above shows that the jobber is now handling a larger share of industrial goods than ever before. Users are finding it to their advantage to look to him for more of their needs. The jobber reduces the user's inventory, assures prompt delivery, provides technical assistance when needed . . . and many other benefits. Are you using him to your own best advantage?



MIDWEST

Jobbers Save You Money, Time and Trouble on Welding Fittings

Midwest Jobbers have the most complete line of welding fittings . . . which often permits them to improve or simplify piping. Only Midwest jobbers offer you a full size range of reducing elbows that take the place of two fittings . . . a straight elbow and a reducer, thus saving space and one weld. There are many other advantages to be gained by using Midwest Welding Fittings . . . see for yourself . . . ask for Catalog 54.

MIDWEST
PIPING COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Clifton, N.J. and Los Angeles

Sales Offices:

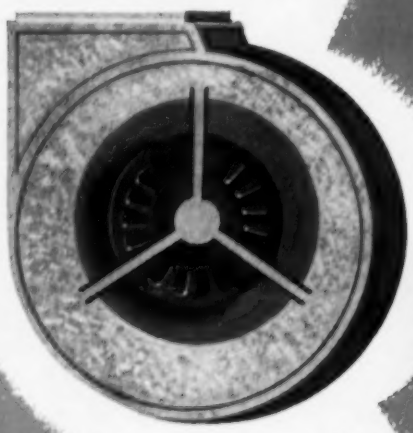
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Boston 27—426 First St. • Los Angeles 33—520 Anderson St.
Houston 2—1213 Capitol Ave. • Tulsa 3—224 Wright Bldg.
Cleveland 14—616 St. Clair Ave. • Miami 34—2103 Le Jeune Rd.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

7416

any shape...any size... any kind of ductwork is better with galvanized steel... is best with

WEIRKOTE



In manufacturing ductwork, galvanized steel has long been relied on for ease and economy of fabrication . . . also providing maintenance-free long life.

But now, ever more fabricators are turning to Weirkote to do the job. Why? . . . Because Weirkote is the *superior* galvanized steel sheet, produced by the most modern continuous galvanizing process . . . quality-controlled from start to finish. It has the tightest of tight zinc coatings . . . resists cracking, peeling, flaking and, above all, corrosion as does no other metal for ductwork of proved durability. Weirkote is far stronger, more rigid, more heat-resistant. These are only a few of the reasons why we say: *In the long run, galvanized steel . . . in the LONGER run, WEIRKOTE.* Let Weirton show you why!

WEIRTON STEEL COMPANY
WEIRTON, WEST VIRGINIA
a division of
NATIONAL STEEL CORPORATION

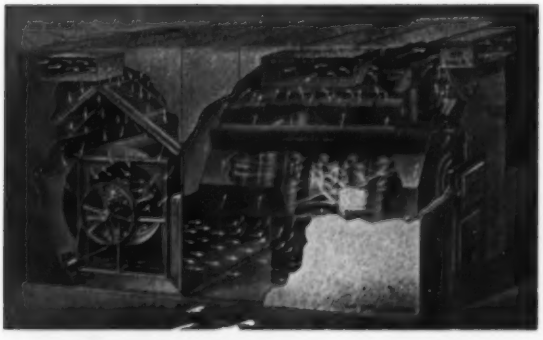
WEIRTON STEEL COMPANY

WARM AIR HEATED... by Campbell

Dane County Arena, Madison, Wisconsin. Heated with two Campbell No. 8250 Oil-fired heaters. Installed 1955 by Carl H. Behrnd, heating contractor, Madison, Wisc.

ECONOMY FOR BIG BUILDINGS

For outstanding performance in large buildings, investigate Campbell Warm Air Heaters. They provide fast heat delivery to meet the varying "on and off" requirements of public buildings. Campbell Heaters are low in cost; are easy to install; deliver exceptional fuel economy; give long, dependable performance to assure maximum customer satisfaction. Your inquiry will receive prompt attention.

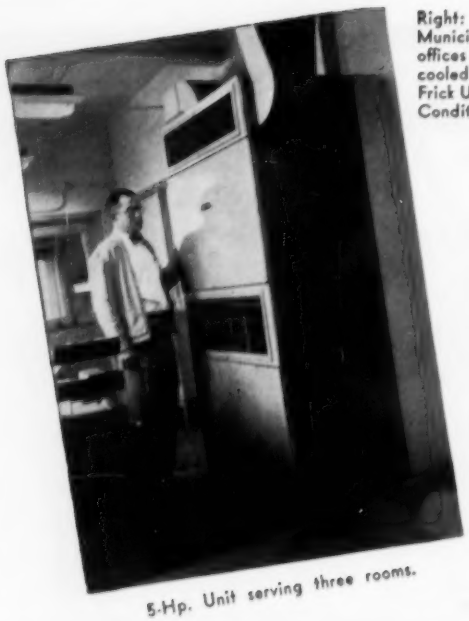


MANUFACTURERS' AGENTS

We have a number of attractive openings for manufacturers' agents who call on heating contractors and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.
Des Moines 17, Iowa
I am interested in your proposition for manufacturers' agents.
My territory covers .....
NAME .....
ADDRESS .....
CITY ..... ZONE .... STATE .....

CAMPBELL HEATING COMPANY
Des Moines 17, Iowa



5-Hp. Unit serving three rooms.

Right: Municipal offices cooled with Frick Unit Conditioners

TRADE FRICK MARK®

Air Conditioning—

Packaged Units or Central Systems

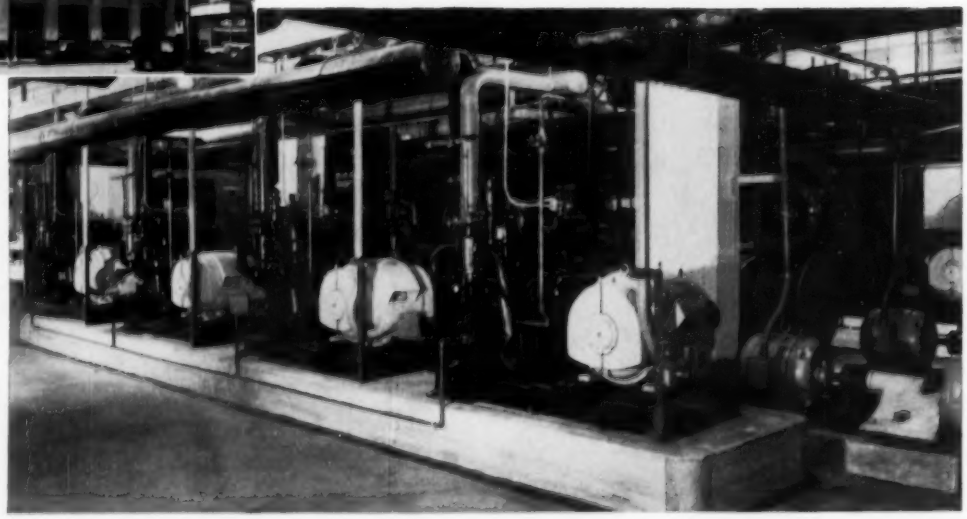
From a 3-hp. unit to a plant requiring thousands of tons of refrigeration is a long step, but they're both included in Frick-engineered air conditioning.

Built into Frick systems are 50 years' experience in air conditioning, nearly 75 in refrigeration, and over 100 in engineering. Nowhere else can you get this unique combination of experience and complete service. Ask for estimates today: write

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

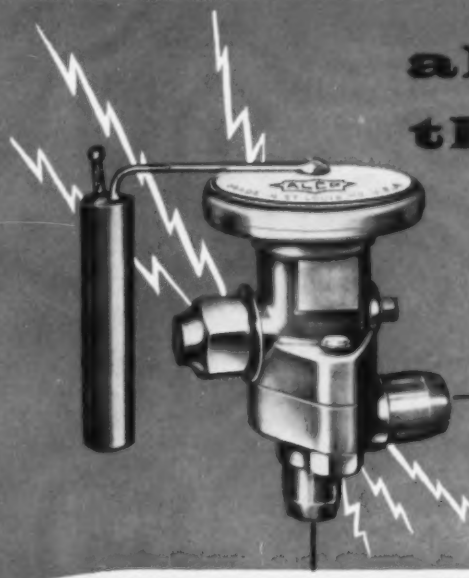
WAYNESBORO, PENNA. U.S.A.



The two 11-story buildings of the American National Insurance Co., at Galveston, are air conditioned by the multiplicity of 75-hp. "ECLIPSE" compressors shown at right. Thousands of fine buildings are Frick-equipped.

alco thermo valves

SUPER-CHARGED
FOR STABLE CONTROL



BODY STYLE FOR ANY APPLICATION

ALCO SUPER CHARGES

Range (Evaporator Temperatures)	Charge Type	Application Examples	Refrigerant				
			Freon-12 †(Yellow)	Freon-22 †(Green)	Methyl Chloride †(Red)	Carrene-7 †(Orange)	Propane †(Black)
			Charge Symbol				
30° F. to 50° F.	Gas	Air Conditioning, Water Chillers, Etc.	*55# MOP FG	*100# MOP HG	*55# MOP MG	*65# MOP CG	*100# MOP PG
0° F. and Above	New Improved Liquid Charge	Industrial, Commercial, Display Cases, Unit Coolers, Etc.	F	H	M	C	P
0° F. to —40° F.	Low Temperature Cross Charge	Locker Plants, Freezers, Hardening Rooms, Cabinets, Etc.	FZ	HZ	MZ	CZ	PZ
"X" CHARGE (ZZ VALVES)							
—40° F. and Below	Ultra Low Temperature Cross Charge	Altitude Chambers, Scientific Equipment, Industrial Processing, Etc.	FX	HX			PX

* The M.O.P. (Maximum Operating Pressures) shown above are standard. Others available upon request.
† Color of nameplate identifies refrigerant.

...straight-through or angle connections...solder or SAE flare.
For all temperature ranges—all operating conditions.
Specify type desired when you order.

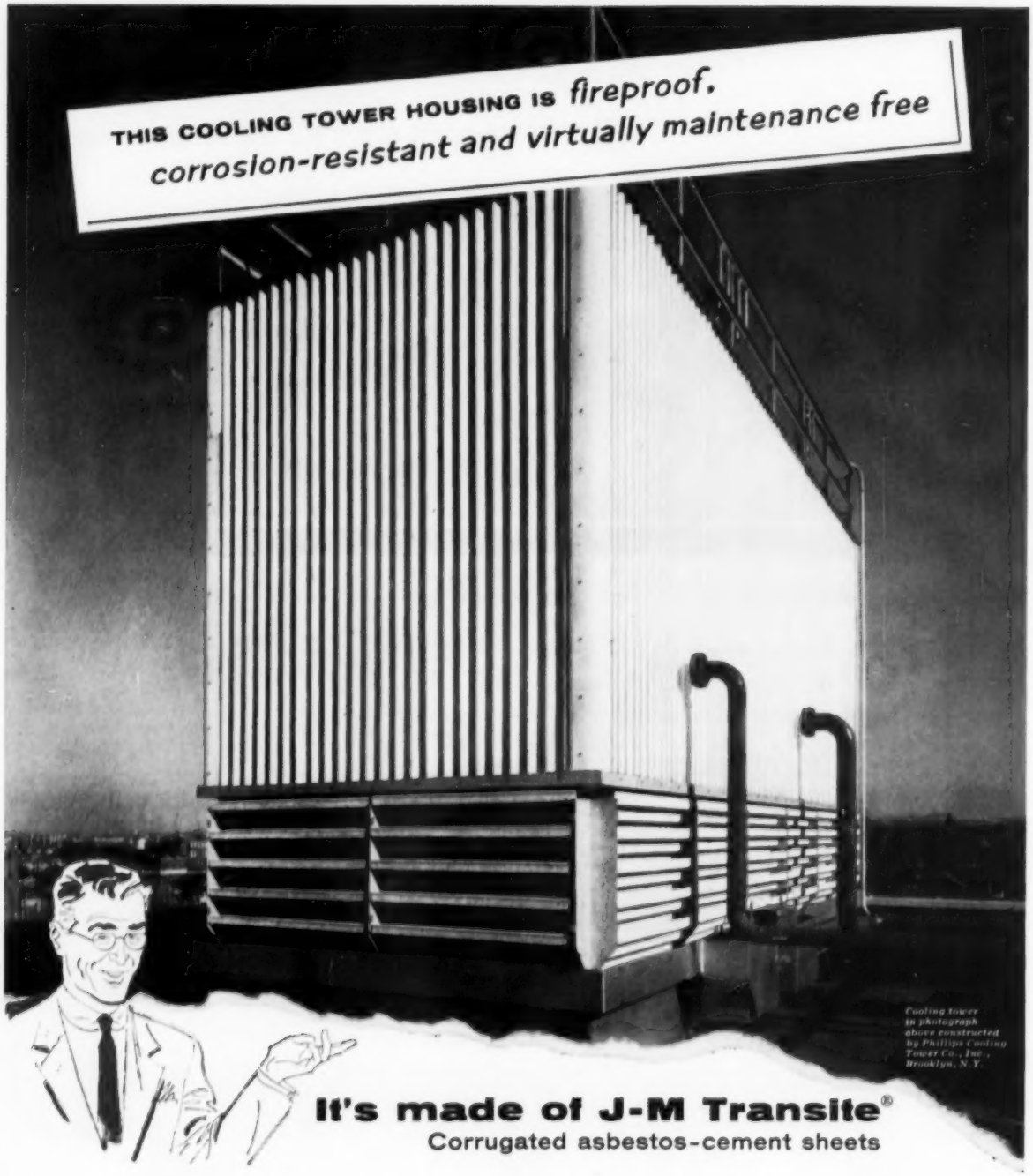
SEE YOUR ALCO WHOLESALER

ASK FOR BULLETIN 171-56

ALCO VALVE CO.
861 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

7085


THIS COOLING TOWER HOUSING IS fireproof,
corrosion-resistant and virtually maintenance free
Cooling tower in photograph above constructed by Phillips Cooling Tower Co., Inc., Brooklyn, N.Y.
It's made of J-M Transite®
Corrugated asbestos-cement sheets

Johns-Manville Transite offers many outstanding advantages for constructing cooling tower housings. This time-tested material provides the ideal combination of properties needed for such rugged service.

It's Fireproof—Completely inorganic, Transite can't burn or support flame . . . greatly reduces the ever-threatening hazard of rooftop fires.

It Resists Corrosion—Transite is unaffected by weather, moisture and most corrosive elements found in industrial atmospheres.

It needs no Maintenance—Transite never needs painting or other protective coating under normal operating conditions . . . its high strength provides long life.

It's Attractive—A soft natural grey in color, Transite blends perfectly with modern architecture. In corrugated or flat form, Transite towers make an attractive addition to most buildings.

Write for further information—For further data and names of manufacturers who can supply cooling towers made of J-M Transite, write to Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit, Ontario.

JM **Johns-Manville TRANSITE** THE MODERN MATERIAL FOR COOLING TOWERS

for the smoothest bending operations

Wheatland Electric Weld Steel Tubing is precision engineered to take the toughest turns with the smoothest ease. Every precaution possible is observed in the removal of the excess weld and in handling to insure the cleanest possible finish.

Our sales force consists of men who understand tubing problems, who can work with you and plan with you for economy and for production.

If you now use or are planning to use Electric Weld Steel Tubing may we suggest that you talk with a Wheatland representative.

WHEATLAND ELECTRIC-WELD STEEL TUBING

WHEATLAND TUBE COMPANY

BANKERS SECURITIES BLDG., PHILADELPHIA 7, PA.

MILLS • WHEATLAND, PA. • DELAIR, N. J.

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY

New headquarters building of Rotary International at Evanston, Illinois

Wagner Motors provide quiet circulating pump power at new headquarters of Rotary International

Electric motors that drive heating system pumps need plenty of electrical and mechanical stamina to hold up under the hard, steady grind expected of them. And, they must be unusually quiet, too. Wagner Motors assure this kind of reliable service—and quiet operation.

That's why Bell & Gossett Company, manufacturers of Hydro-Flo Circulating Pumps, chose Wagner Motors for their Universal Pumps used in the new Rotary International Headquarters at Evanston, Illinois.

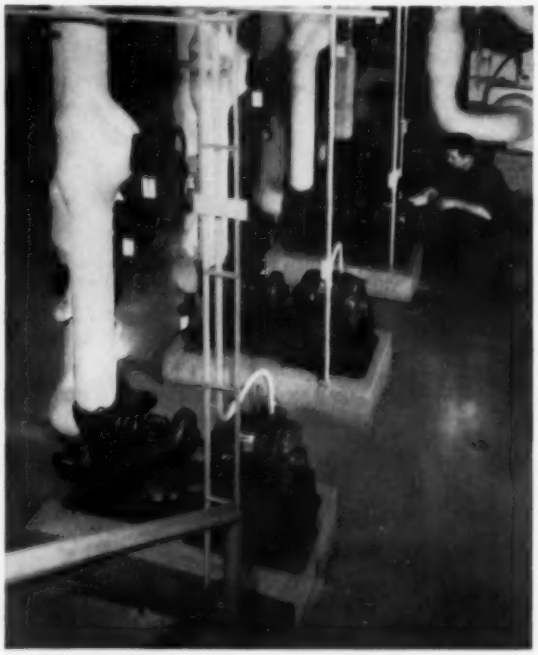
Part of this installation is shown at right. The motors in the foreground are 7½ horsepower, quiet-type Wagner Polyphase Motors, especially selected for smooth balance and quiet operation. The other motors in this installation are standard, resilient mounted 5 horsepower Wagner Polyphase Motors.

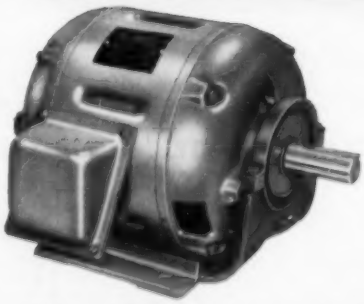
Here's where you can take a tip from Bell & Gossett . . . when you need dependable, *quiet* motors—5 horsepower or below—choose Wagner resilient mounted *standard* motors.

They are available with resilient bases in both sleeve and ball bearing types. You save money—and get the quiet operation that only a specially selected or resilient mounted motor can give.

Perhaps you have a specialized motor application . . . if so, remember, there's a Wagner motor to fit every need . . . a complete line for all current specifications with a wide variety of enclosure types and mountings.

Your nearby Wagner engineer can help you select the *right* motor to meet your specifications. Call the nearest of our 32 branch offices or write us.





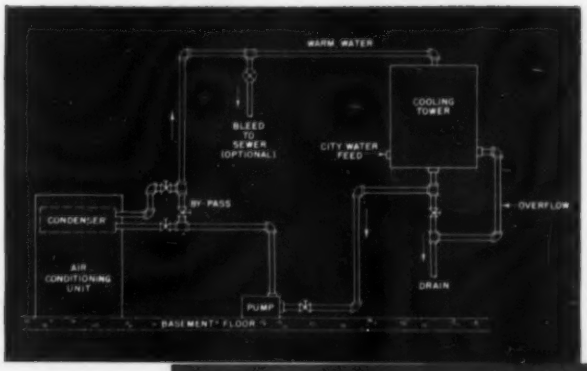
These Wagner standard motors, in ratings up through 5 horsepower, can be used for specialized applications because they are available in sleeve bearing or ball bearing models with rigid or resilient mounts.

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U. S. A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

WM56-11

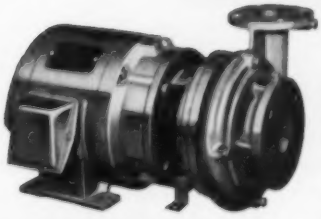
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC



QUIETER PUMPS

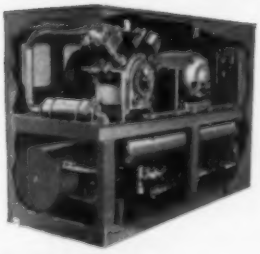
FOR COOLING TOWER APPLICATIONS

B&G 1522 CENTRIFUGAL PUMPS



B&G SERIES 1531-B CENTRIFUGAL PUMPS

Equipped with self-lubricating, leak-proof "Remite" Seal. Superfinished shaft oversized for minimum deflection. Impeller is of sound hydraulic design, with balancing ring and relief holes to reduce thrust. Heavy duty ball bearing motor. Capacities to 1200 GPM, heads to 420 ft. Many sizes carried in factory stock.



B&G PACKAGE LIQUID COOLER

A complete cooling unit for homes, apartments, commercial and industrial buildings. Low pressure drop through evaporator—non-recycling pump down—integrated electrical control system—complete wiring—are a few of many outstanding features. Send for Bulletin HB-755.

Get rid of pump noise troubles in your cooling installations ...next time install a B&G 1522!

This pump is *really quiet*...because *both pump and motor* are equipped with long bronze sleeve bearings...and because of the noise-dampening flexible spring-type coupler.

The B&G 1522 offers an impressive number of other features for dependable, low-cost operation. The "Remite" Mechanical Seal, for example, ends leakage troubles. It's self-lubricating—harder than glass—wear-proof. The impeller is dynamically balanced for smooth, vibrationless operation... the entire bearing bracket assembly, including shaft and sleeve bearing, is interchangeable. Servicing is simple—the 1522 separates into three parts.

All these plus values cost no more—the B&G 1522 Pump is *competitively priced!* It is available as an all-iron, bronze-fitted, all-bronze or a stainless steel unit, with capacities to 150 GPM, heads to 115 ft. Available in common sizes from factory stock. Send for Catalog.

Send for your free copy of the B&G Six Step Manual for Designing Cooling Tower Systems.

BELL & GOSSETT
COMPANY
Dept. REK-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, W. Toronto

TYPE 657A

Double port globe body for conventional service. Also supplied single port where tight closure required. Normally supplied in iron or steel in sizes ½" thru 12".

TYPE 657YY

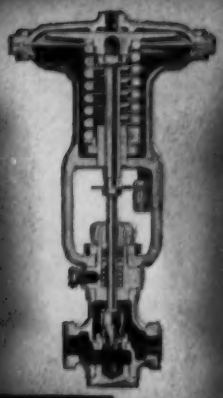
Three-way control valve for by-pass or blending service. Eliminates need for two globe type control valves. Available all castable alloys sizes ½" thru 12".

FISHER

Has the control valve for your plant

TYPE 667Z

Split type body in which parts are readily accessible; can be economically supplied in various alloys for corrosive service. Available in flanged sizes ½" thru 2".



TYPE 510G

Small and compact bronze control valve for relatively light service. Available in screwed sizes ½" thru 2".

TYPE 657-45B

Angle control valve for handling fluids containing solids, or flashing liquids which are erosive. Normally supplied in steel flanged ends in sizes 1" thru 6".

TYPE 657-SAUNDERS

Fisher operator on Saunders patented valve is widely used on "hard to handle" fluids which are viscous and/or corrosive. Available in wide variety of materials in sizes ½" thru 6".

Special design bodies for process services

Wide selection of sizes and available in all castable alloys

Supplied with improved diaphragm operator that provides accurate valve response

FISHER GOVERNOR COMPANY • MARSHALLTOWN, IOWA

CANADIAN PLANT: WOODSTOCK, ONTARIO

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

What a truly modern heating plant looks like

IRON FIREMAN FORCED DRAFT FIRING UNITS
with matched Kewanee boilers owned by Briggs
Manufacturing Co. (Beautyware Division) Detroit

Jahr-Anderson Associates, Architect-Engineer, Dearborn, Mich. W. J. Rewoldt Co., Mechanical Contractors, Detroit. Iron Fireman equipment installed by Comb & Groves, Detroit.

COMPLETE FIRING SYSTEM IN ONE PACKAGE

Every essential component is built into this Iron Fireman forced draft firing system, including burner, control panel, forced draft air supply and fuel system. Complete unit is factory assembled, wired, and tested.

FIRES ALL TYPES OF BOILERS

Firing unit can be applied to any type of boiler with great advantages in installation costs and operating efficiency. Complete boiler-burner unit is also available as pictured above, with matched Scotch type boiler. Installation requires little more than service connections. No high stack needed.

ONE CONTRACT—ONE RESPONSIBILITY

Installation costs are greatly reduced. No separate contracts for control system, electrical wiring, oil heaters, or burner setting.

FOR GAS OR OIL, OR OIL-GAS COMBINATION

Takes any type of high or low pressure gas, or any grade of oil from No. 2 to No. 6. Oil-gas model can be switched from one fuel to another at a moment's notice without loss of firing efficiency.

IRON FIREMAN®

Automatic firing equipment for heating, processing or power with oil, gas or coal.

COMMERCIAL • INDUSTRIAL • RESIDENTIAL

The smart way to modernize

Unlike typical conversion burners, the Iron Fireman forced draft firing system is completely assembled at the factory, and mounted on a permanent base for fast and accurate application to your present boiler. It is a completely engineered unit, leaving no intricate wiring or piping for completion on the job.

Where a complete boiler-burner unit is required, the Iron Fireman forced draft firing system is supplied as an integral part of a matched Titusville or Kewanee boiler, as in the Briggs plant pictured above. The rated capacity of these boiler-burner units (for either high or low pressure steam) allows an ample margin which can easily carry overloads of 50% or more. This permits a comfortable "cruising speed" that assures long life and low maintenance costs.

Ask for full information

Send coupon for complete technical description and specifications.

IRON FIREMAN MANUFACTURING COMPANY
3044 West 106th Street, Cleveland 11, Ohio.
In Canada: Write 80 Ward Street, Toronto, Ontario.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

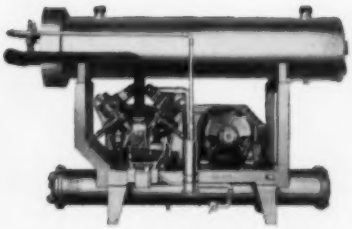
3 FACTUAL reasons *why* Curtis *dealers can make more money— CONSISTENTLY:*

1. CURTIS has 102 years of experience in manufacturing precision made equipment. One of the first manufacturers of packaged air conditioning units—since 1936.

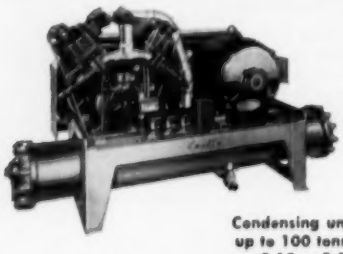
2. Unsurpassed know-how for building air conditioning units that operate longer with less maintenance and service—YET ARE COMPETITIVELY PRICED with generous profit margin for you.

3. CURTIS provides sales and promotional aids—a complete financing plan—and a national advertising campaign to make your selling easier.

Evaporative Condensers and Cooling Towers up to 100 tons. Air handling units to match.



Packaged Liquid Chillers— 7½ to 100 tons—F-12 or F-22. With room console units to provide controlled cooling and heating without duct work.



Condensing units up to 100 tons— F-12 or F-22.

Packaged units in a rainbow of colors— a CURTIS exclusive. 3 through 50 tons.

Packaged Air Cooled Air Conditioning Units— 2 through 7½ tons. Residential and Commercial applications.

Remember YOU CAN COUNT ON **Curtis**

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AUTO LIFTS

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AUTOMOTIVE AIR COMPRESSORS

1854 · 1956 our 102ND year OF SUCCESSFUL MANUFACTURING EXPERIENCE

CM-11

Gentle heat uniform, healthful

...yours from Modine –
first name in convector radiation

FOR those who want modern heating at its finest, there's only one answer – Modine convector radiation. Unmatched performance is combined with quiet beauty . . . long life with uniform, healthful heating. Exclusive features, like fingertip damper control, are further reasons why architects and engineers select Modine for their finer buildings.

You can choose from 30 types, 8000 sizes of Modine Convectors—deluxe, standard and institutional models—free-standing, fully and partially recessed. Call the Modine representative listed in your classified phone book, or write Modine Mfg. Co., 1500 DeKoven Ave., Racine, Wis.

Modine
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R-1304

In Canada: Sarco, Ltd., Toronto

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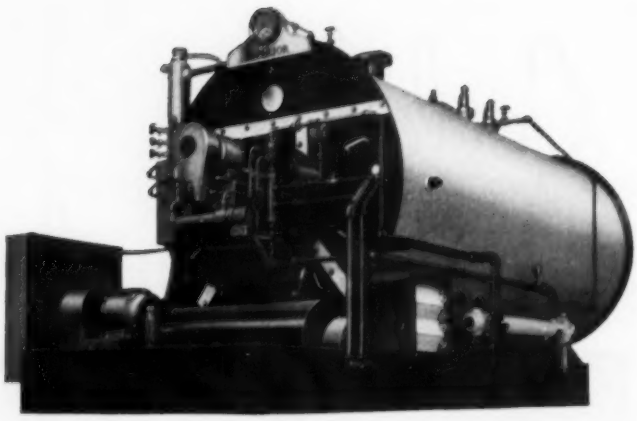
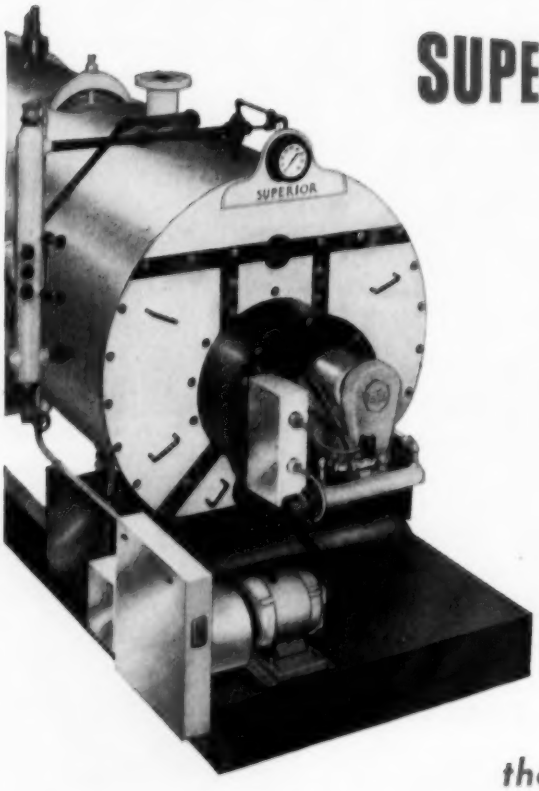


. . . and built for years of extra service



SUPERIOR STEAM GENERATORS are the only packaged units with an integrated and built-in *induced* draft system (as shown at the left).

Superior's induced draft maintains a negative pressure in all 4 passes of the boiler as well as in the combustion chamber eliminating the need of spring-loaded pressure relief doors commonly used on forced-draft types, and eliminating the forcing of dirt, soot or combustion gases into the boiler room.

The multiple fans operating at lower tip speeds also eliminate much of the noise and the high speed "whine" found where high speed turbines are used.

A very important advantage of Superior's *induced* draft system is in the evenness of its draw across all of the tubes in the fourth pass. This even distribution of the hot gases eliminates the danger of overworked or burnt out tubes and adds years to the life of the boiler.

Superior Steam Generators are built in 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. burning oil or gas or both.

Write today for Catalog 804F

the most rugged and dependable

packaged fire tube boiler made . . .

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
STEAM GENERATORS

Snow doesn't melt over GILSULATE® covered underground steam lines

Steam line with 5" partial dirt backfill—steam turned into line. A light snow fell during the evening and still remained late the following day.

Indianapolis Power & Light Company chose GILSULATE for a recent installation on a busy downtown Indianapolis street. In addition to its outstanding insulating efficiency—snow didn't melt over a partially insulated line—and corrosion protection, GILSULATE's high loading capacity makes it the ideal choice for such an installation. The 6" line runs for 185 feet directly under the sidewalk, at an average trench depth of 4'6".

Nine tons of GILSULATE (type B for 300-385° F. temp. range) were used; only 100 man-hours were required to complete the job exclusive of excavation and backfill.

More and more, architects, engineers and contractors are discovering the *versatility* of GILSULATE.

For schools, railroads, hospitals, airports, utilities, housing projects—for big jobs or small—GILSULATE provides permanent corrosion protection for hot underground pipes at a cost far below that of any other pipe insulation system.

Investigate the value of this dependable, easily-installed, low-cost GILSULATE. Use the coupon below or see your local GILSULATE distributor.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp...pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS**: no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING**: for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE**:
   Type A for 220°-300°F. temp. range
   Type B for 300°-385°F. temp. range
   Type C for 385°-520°F. temp. range

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-B West Broadway, Salt Lake City 1, Utah
or
1145 East Jersey St., Elizabeth 4, N. J.

Send me more information on GILSULATE Insulation

NAME .....

TITLE .....

COMPANY .....

ADDRESS .....

HPA

Valley Forge cut production time and reduced costs with Pittsburgh Superfine Fiber Glass Insulation. Two employees are applying insulation to boiler jackets. Superfine reduces weight factor of finished product.

Pittsburgh Superfine Insulation is easily stored, handled and cut.

"PITTSBURGH SUPERFINE has definitely increased our output"

—says Mr. Paul Fusco, Plant Manager

Valley Forge Metals Division of Nicolet Industries, Inc.
Lansdale, Pennsylvania

"It used to take four men two to three days to insulate 400 boiler jackets when we used another type of insulation. Today, using Pittsburgh Superfine Fiber Glass Insulation, four men do the same job in about a day and a half!" reports Mr. Fusco.

When Valley Forge, a fabricator of boiler jackets, baseboard radiation units, and gas, electric and hot water units, switched to Pittsburgh Superfine Insulation, they immediately gained many operating advantages.

With lightweight Superfine, Valley Forge shortened time required to cut insulation for boiler jackets. Insulation application time was reduced 20% since Superfine is held in place with adhesive; this change eliminated a clip-fabricating and spot-welding operation, and reduced spoilage to zero.

"Superfine is flexible, readily follows jacket radii and covers the product more easily," stated Mr. Fusco. "It has a higher insulating value for boiler jackets, too. Its lightweight characteristics make it easy to handle and it reduces the weight of the finished product as much as 20 to 30 pounds, saving on shipping and it helps us keep the plant clean."

LET PITTSBURGH SUPERFINE HELP YOU, TOO!

Pittsburgh Superfine is composed of extremely fine glass fibers and is a lightweight, efficient thermal and acoustical insulating material . . . ideal for controlling heat or cold, absorbing sound or deadening vibration.

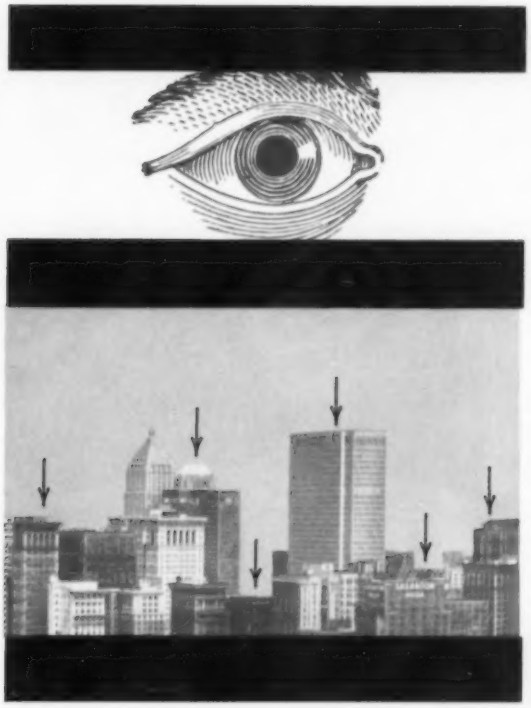
If you have insulating problems, Pittsburgh Superfine may be your answer. Why not call us for consultation? *Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Penna.*

PITTSBURGH SUPERFINE IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

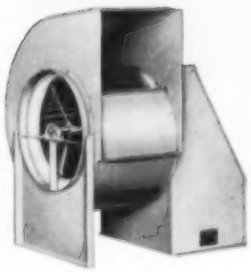
Sales Offices are located in the following cities: Charlotte Chicago Cincinnati, Cleveland Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER GLASS PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY



A NEW LOOK AT "THE FORGOTTEN FAN"



Up on the roof, "the forgotten fan" is out of sight, out of mind . . . until wind, rain, snow and sleet cause costly breakdowns due to exposure and lubrication neglect. In the past when the heart of a blower was broken by weather, there was nothing for it but to repair or replace.

Today, after a searching look at roof blowers, Utility has a more practical answer: a complete line of quality engineered Enclosed Drive Blowers designed for punishing outdoor duty.

Every one has motor and drive completely enclosed for positive protection against dirt, moisture and drastic temperature changes. Permanently sealed, pre-greased ball bearings forever prevent breakdowns due to maintenance neglect.

Best news of all: you pay no premium for this superior performance, due to Utility's progressive production techniques. So, if you think it's high time for a new look at blowers for roof installations, be sure to take a good look at the Utility line . . .

A DIVISION OF UTILITY APPLIANCE CORP.

UTILITY FAN CORP.

911 EAST 59TH STREET, LOS ANGELES 1, CALIFORNIA

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

Engineers: Jaros, Baum and Bolles
Mechanical Contractors: Alvord and Swift

Conditioned air is delivered to all offices and public rooms of the new, modern Statler Hotel in Hartford, Connecticut, through Kno-Draft Adjustable Air Diffusers. Both round and square units are used—and a few of the new slot-type Kno-Drafts (not shown).

Primary reason for selection of Kno-Draft was the greater comfort assured by *draftless* air movement, uniform temperature, and the easy and accurate control of both air volume and flow pattern.

And notice how neatly the Kno-Draft squares fit into acoustical ceilings and how—square or round—the handsome Kno-Draft units blend unobtrusively with the architectural scheme of things.

For complete specifications, engineering and installation information on Kno-Draft round, square and slot-type diffusers, simply write on your letterhead to Connor Engineering Corporation, Dept. G-76, Danbury, Conn.

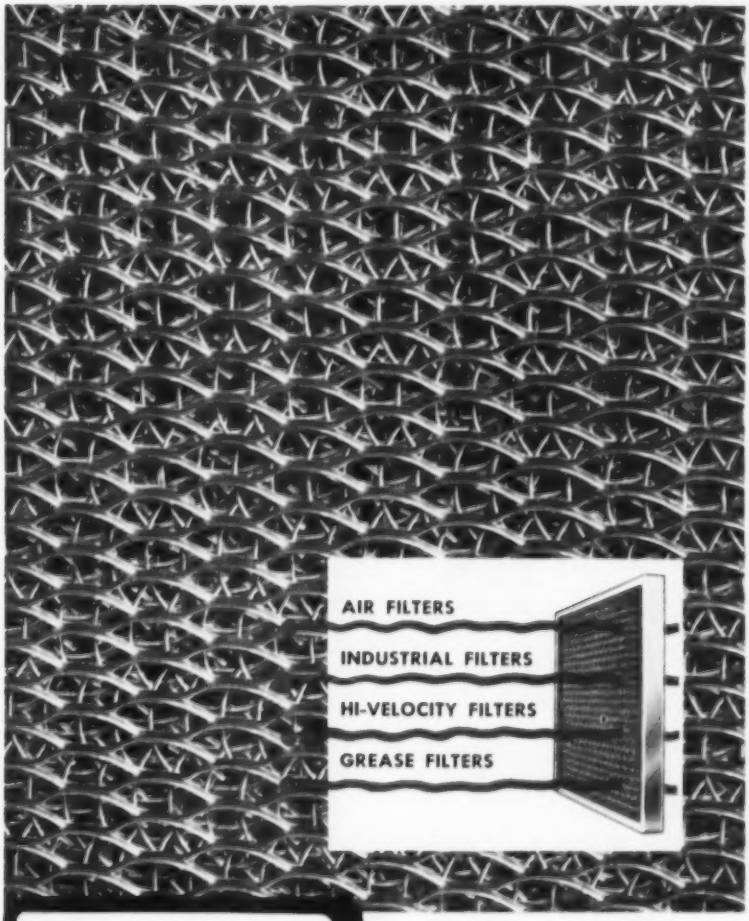
CONNOR ENGINEERING CORPORATION

kno·draft®
adjustable air diffusers

THESE **BIG CAPACITY** FILTERS*

DEFINITELY

LOWER AIR CLEANING EXPENSE



- **CONSISTENT *DOUBLE*-LINT-HOLDING-CAPACITY**
  Evans precision stamped, precision assembled pack, with larger openings on inlet side . . progressing to smaller openings on outlet side—absorbs far greater quantities of lint and dust without choking off air flow.
  Both laboratory and field tests have conclusively proven: EVANS FILTERS COLLECT AND HOLD MORE DUST AND LINT FROM THEIR INITIAL RESISTANCE TO .050" wg., .075" wg., 1.00" wg., OR WHATEVER RESISTANCE DEEMED NECESSARY TO CLEAN FILTERS.
- **LIFETIME DESIGN PROVIDES LOWER COST PER CUBIC FOOT OF AIR HANDLED**
  One filter purchase . . one set of filters lasts life of your customers' air handling equipment. ELIMINATES "NUISANCE" CALL-BACK EXPENSE.
- **ALL ALUMINUM DESIGN PROVIDES LOWER COST PER CUBIC FOOT OF AIR HANDLED**
  Every part precision stamped from aluminum (*NOT A FOIL*). Rust proof. Light weight. Easy to handle. No dangerous edges, sharp wires to cut hands, tear clothes.
- **MAINTAIN OFFICIALLY RATED DUST HOLDING CAPACITY IN THE FIELD**
  Evans filters are tested with a realistic dust (contains 18% lint). THE KIND OF DUST ACTUALLY FOUND UNDER TRUE OPERATING CONDITIONS. This has resulted in *Evans exclusive BIG CAPACITY design.*
- **EVANS FILTERS SAVE 50% ON CLEAN AIR MAINTENANCE COSTS**
  They use no messy, high tension adhesive oil—only a few ounces of fluid which acts as both adhesive and detergent. Simply, easily cleaned with hose and tap water.
- **KEEP YOUR CUSTOMERS HAPPY—ELIMINATE NUISANCE CALL BACKS. ASSURE YOURSELF *BIGGER FILTER PROFITS*—GET FULL DETAILS TODAY ON EVANS LIFE-LONG AIR FILTERS.**

Evans* *Lifelong Air Filters*

MAIL COUPON TODAY!

FREE COMPLETE ENGINEERING DATA

- DUST LOAD CURVES
- EFFICIENCY RATINGS
- PRESSURE LOSS CURVES

THE GEORGE EVANS CORPORATION • MOLINE, ILLINOIS

Gentlemen: Rush full details on how BIG CAPACITY EVANS AIR FILTERS will definitely lower air cleaning expense, MAKE ME BIGGER PROFITS.

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COMPANY _____

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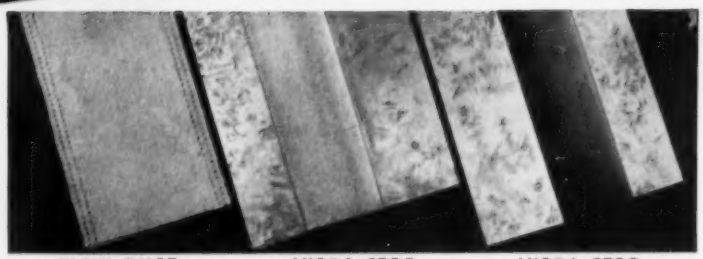
Grant Wilson Flexible Duct Connections

...the connectors that give you ALL the advantages:

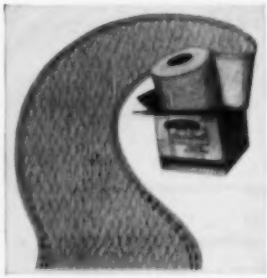
1. ALL three types to choose from
2. ALL three lengths—25, 50, 100 ft. rolls
3. Both 24 and 26 gauge metal
4. New "Punch-Lock" seam for permanent metal-to-fabric bond
5. No. 1 Prime galvanized metal used exclusively

- the *RIGHT* size
- the *RIGHT* materials
- the *RIGHT* design
- the *RIGHT* principle!



FLEXI-DUCT | VIBRA-STOP (Asbestos) | VIBRA-STOP (Canvas)

Check the *Quality Features* of these Grant Wilson Products

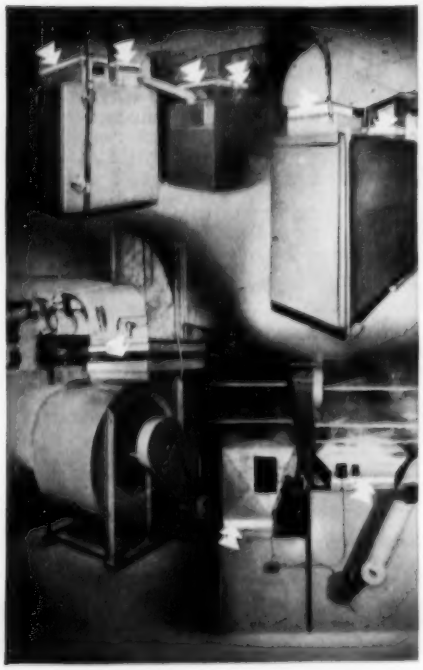


Flexi-Duct

...Woven Asbestos Flexible Tape. (Underwriters' Grade). Meets recommendations of National Board of Fire Underwriters. Comes in 6-inch, 50 foot rolls and 8-inch, 150 foot rolls, both with selvaged edges. Can be taped, bolted or otherwise easily and permanently secured to equipment or ductwork.

Vibra-Stop

...Asbestos or Canvas fabric, 4" wide, factory "Punch-Lock" sealed to 4-inch No. 1 Prime galvanized metal on one side, 3-inch on the other. Asbestos used is heavy Underwriters' Grade and meets Fed. Spec. MIL-C-4177. Canvas, also Underwriters' Grade, meets Fed. Spec. MIL-D-10860. 25 foot, 50 foot and 100 foot rolls in handy "roll out" cartons.



Composite photo shows typical installations of FLEXI-DUCT and both types of VIBRA-STOP.

SEE YOUR JOBBER... OR WRITE DIRECT FOR SAMPLES

Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS

141 W. Jackson Blvd. Chicago 4, Ill.

Tough Expansion Joint Problem?

Put the Badger Man on the Spot!

Complex expansion joint problems are *best* analyzed at only one place: your office or plant site. It's there alone that *all* essential data about your proposed installation is available.

And it's there — *on the spot* — that the Badger Man is ready to apply his unique abilities. He is a trained engineer *and* he brings to your problem the background of the world's most experienced manufacturer of expansion joints.*

Next time you are confronted with a complicated piping layout, severe operating conditions, unusual size and shape requirements — *any* complex expansion joint problem — put the Badger Man on the spot! His services are as close as your telephone.

COMING SOON — Badger Service-Rated Expansion Joints. Incorporate revolutionary new features developed during three years of intensive research and testing. Watch for this important announcement.

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BADGER EXPANSION JOINTS

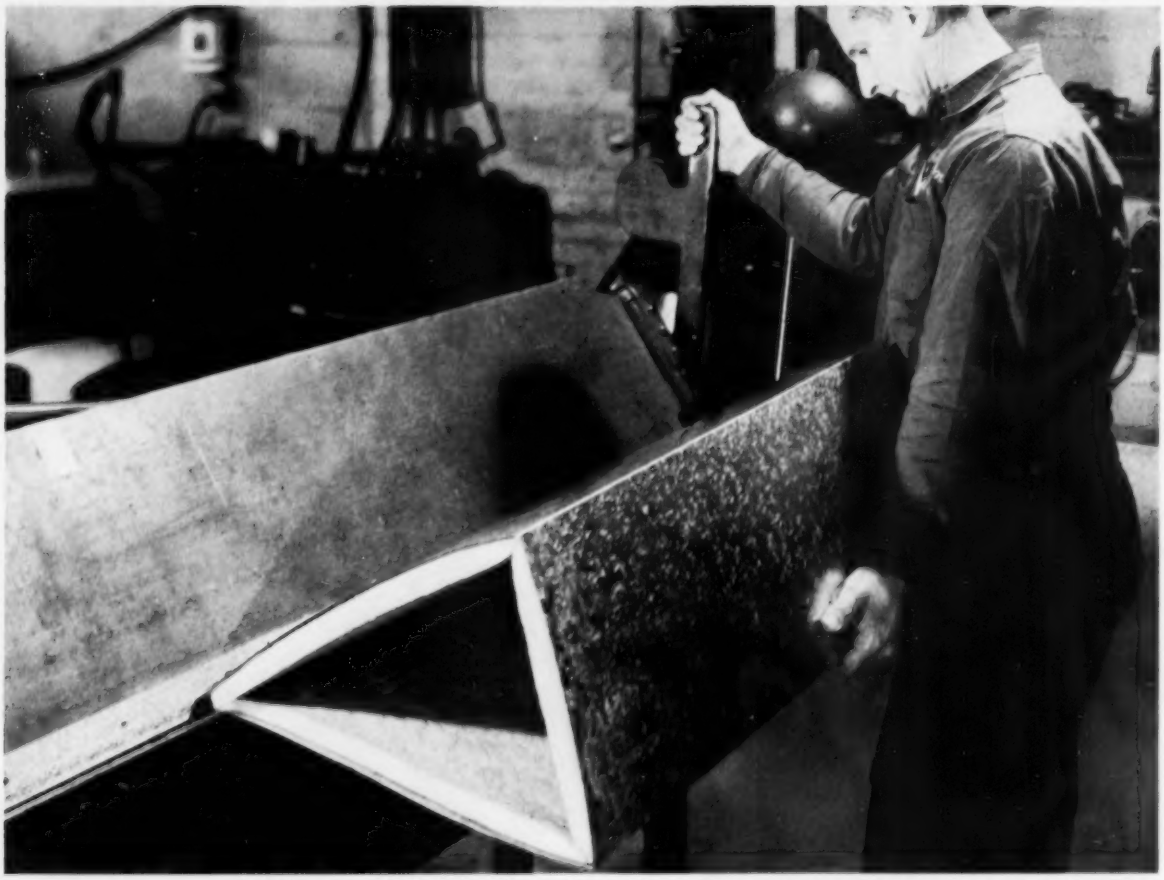
BADGER MANUFACTURING COMPANY

230 Bent Street, Cambridge 41, Massachusetts • 60 East 42nd Street, New York 17, New York

Representatives in principal cities

* Badger has been solving tough expansion joint problems for 50 years — a record unmatched by any other firm.

INSULATION news from L·O·F GLASS FIBERS COMPANY



A single piece of L·O·F Glass Fibers' Duct Liner can be cemented to metal and formed in the brake!

Right from the roll to the duct!

Unlike old-fashioned, rigid insulation, L·O·F Glass Fibers' Microlite and Super·Fine blanket insulations are resilient and flexible. They handle pleasantly, without "kid glove" treatment! Easily cut with ordinary knife! Quickly installed—without special tools or skills—L·O·F Glass Fibers' Duct Liner requires no precision cutting or fitting . . . works easily into irregular parts such as elbows. Your costs are kept to a minimum.

The extremely fine glass fibers in Microlite and Super·Fine form millions of tiny dead air cells. For this reason, they are exceptionally efficient acoustical and thermal insulations! Look at all the other important advantages . . .

- *High tensile strength* . . . easy to use, reduce danger of tearing!
- *Compactly packaged in standard widths* . . . compressed to take up a minimum of storage space, yet spring back to original thickness when unrolled.
- *Lightweight* . . . liner adds an insignificant amount of weight!
- *Fire-resistant* . . . glass fibers do not support combustion!
- *Permanent* . . . will not rot!

Neoprene- or vinyl-coated Microlite and Super·Fine are recommended for normal and high velocities . . . uncoated liner may be used for lower velocities. For complete information, contact your nearest distributor; or write *L·O·F Glass Fibers Company, Dept. 39-76, 1810 Madison Avenue, Toledo 1, Ohio.*

MICROLITE
LOF GLASS FIBERS
SUPER·FINE

L·O·F GLASS FIBERS COMPANY

TOLEDO 1, OHIO

Makers of glass fibers by the exclusive "Electronic-Extrusion" process

Practical Data on Air Distribution

Prepared by the Engineering Department of Tuttle & Bailey, New Britain, Connecticut

Selecting the Throw

As a service to those responsible for specifying air distribution equipment, Tuttle & Bailey will publish a series of technical articles on this all-important phase of heating, ventilating, and air conditioning systems. It is hoped these articles will be of help to the newcomers in the field and serve as "refresher" information for others.

By definition, "throw" is the distance or radius in feet that an air stream travels from its point of discharge to a point at which a desired terminal velocity is reached. Determining the correct throw for an installation of ceiling diffusers or sidewall grilles and registers is a matter of careful analysis of job conditions and application of the following basic principles.

Ceiling Diffusers

The terminal velocities recommended below are necessary to provide satisfactory performance because of the rapid rate of temperature and energy equalization provided by the circular air pattern.

•

100 FPM Terminal Velocity
30 FPM Average Residual Velocity

Recommended where people are located adjacent to walls of structure for extended periods of time at sedentary occupations:

Private offices — Residences
Apartments — Hotel bedrooms
Hospitals, Private rooms, and Wards

•

150 FPM Terminal Velocity
50 FPM Average Residual Velocity

Recommended where people are not located adjacent to walls of structure for extended periods of time:

General offices — Department stores
Restaurants — Clothing stores
Theaters — Operating rooms — Churches

•

200 FPM Terminal Velocity
70 FPM Average Residual Velocity

Recommended where people are not located adjacent to walls of structure at any time:

Industrial plants — Corridors
Process areas

All other factors being equal, the use of different terminal velocities will affect the throw of a given size diffuser when handling a given CFM, and also the residual velocities in the occupied space. For example, if a diffuser with a 9′ throw at 100 FPM terminal velocity is selected when the measured throw is 12′, the remaining 3′ will be properly conditioned although the terminal velocity at the 12′ point will be lower than that originally chosen for the installation. The residual velocity will also be somewhat reduced. In cases where the measured throw is somewhat less than that provided by the selected diffuser, results will be satisfactory even though the terminal and residual velocities at the end of the measured throw will be higher than that originally selected.

Most diffusers are installed in rooms with ceiling heights of 8′ to 12′ and this variation will not affect diffuser selection. However, when ceiling heights are above 12′, a corrected procedure should be used:

1. Measure distance from diffuser to nearest wall or opposing air stream.
2. Measure distance from ceiling to a point 12′ from floor. Add to the distance in Step No. 1, 75% of the difference between the actual ceiling and the 12′ height.
3. Use this value as the total throw and select diffuser for desired terminal velocity.

For installations with excessive ceiling heights, it is advisable to increase the CFM per diffuser and use fewer diffusers. For ceiling heights below 9′, it is advisable to reduce the CFM per diffuser to a minimum and use more diffusers.

Grilles and Registers

Unlike ceiling diffusers, grilles and registers have a comparatively low induction rate. The air stream moving in just one direction induces room air into the primary stream which means room air must be replaced by non-induced room air. This causes a counterflow residual air movement about equal to terminal velocity. As ideal residual air motion is 50 FPM or less, terminal velocity should not exceed 50 FPM and grilles should be sized on that basis.

When selecting grilles and registers, keep these points in mind:

1. The throw from a straight-flow grille varies with the square root of the core area of the grille and with the face velocity.

2. The ratio of height to width has no appreciable effect on the distance of the throw from grilles where the ratio is less than 25:1.

3. If air streams from a grille are converged, it results only in reducing the effective area of the grille.

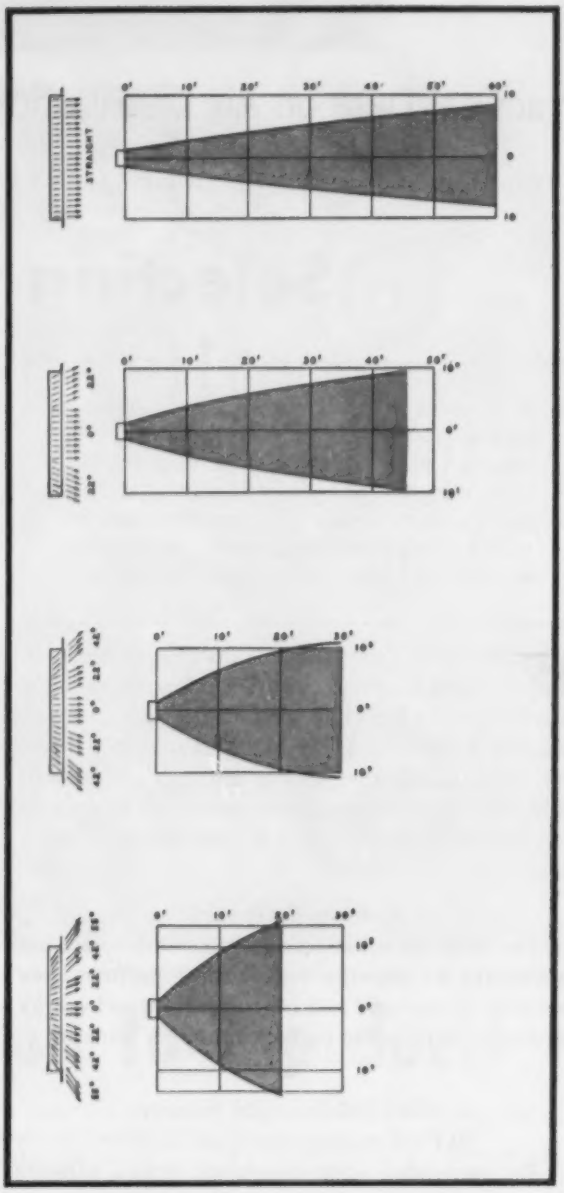
4. Breaking the air stream into jets has no effect on the rate of mixing or the throw.

5. Deflecting the air stream by turning the vanes outward to increase the spread, shortens the throw, depending on the degree of deflection.

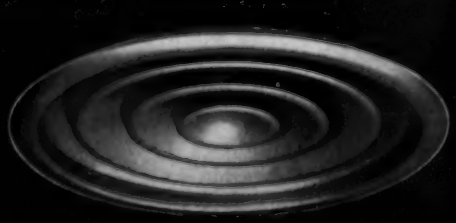
6. The drop for a given throw varies about inversely as the face velocity for an air stream below room temperature and varies directly as the temperature differential.

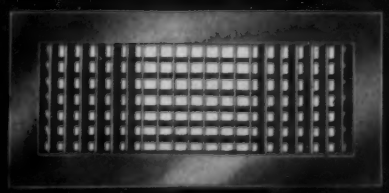
In locating grilles, it is important to visualize the air patterns which various deflection settings produce. The patterns illustrated at right are based on a 24″ x 6″ grille. Grilles should be spaced so that edges of the streams from adjacent grilles do not meet before the stream has traversed over 50% of the required throw, otherwise undue turbulence in the occupied zone will result.

Air Patterns
Produced by Typical Deflection Settings



If you have a specific problem involving air distribution, Tuttle & Bailey's Engineering Department will welcome the opportunity to be of help. Address: R. D. Tutt, Chief Engineer, Tuttle & Bailey, New Britain, Connecticut.



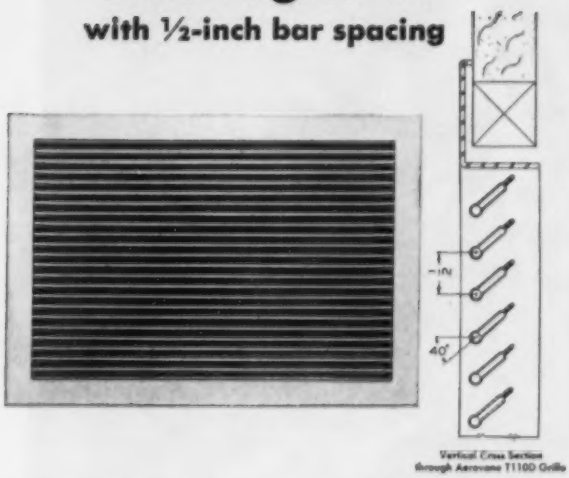


NEW PRODUCT NEWS from T&B

Aerovane

return air grilles and registers

with ½-inch bar spacing



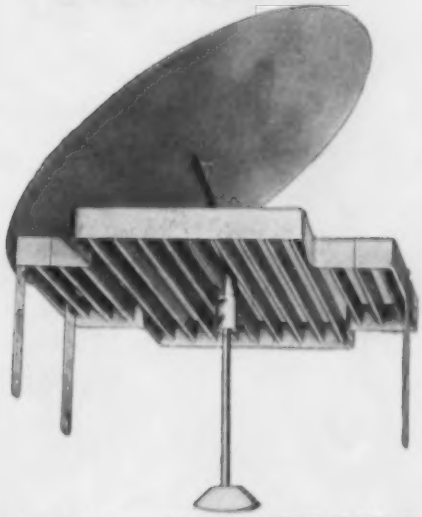
Vertical Cross Section through Aerovane T1100 Grille

This new design for the Aerovane line features horizontal bars set at an angle of 40° on ½-inch centers . . . a modern, streamlined appearance that virtually eliminates objectionable see-through. Aerovane T110D Grille is illustrated above . . . Aerovane T117D Register combines grille and adjustable opposed blade damper unit.

For full information, write for Bulletin 201.

No. 6 Type TFD

volume control damper insures positive, quiet operation



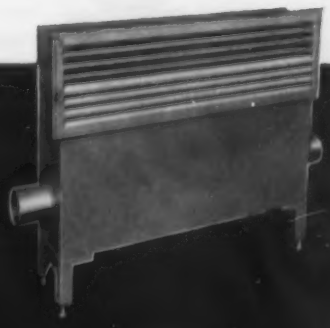
Designed for use with T&B AEROFUSE Ceiling Diffusers where short coupled connections are required. Unit consists of a single blade damper hinged to an adjustable bar grid. Damper setting is regulated through the face of the diffuser by means of an operator handle and rod which may be kept permanently in place or used as a removable key.

For full information, write for Bulletin 112.

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

A complete line
of air distribution equipment and accessories
for low and high pressure systems



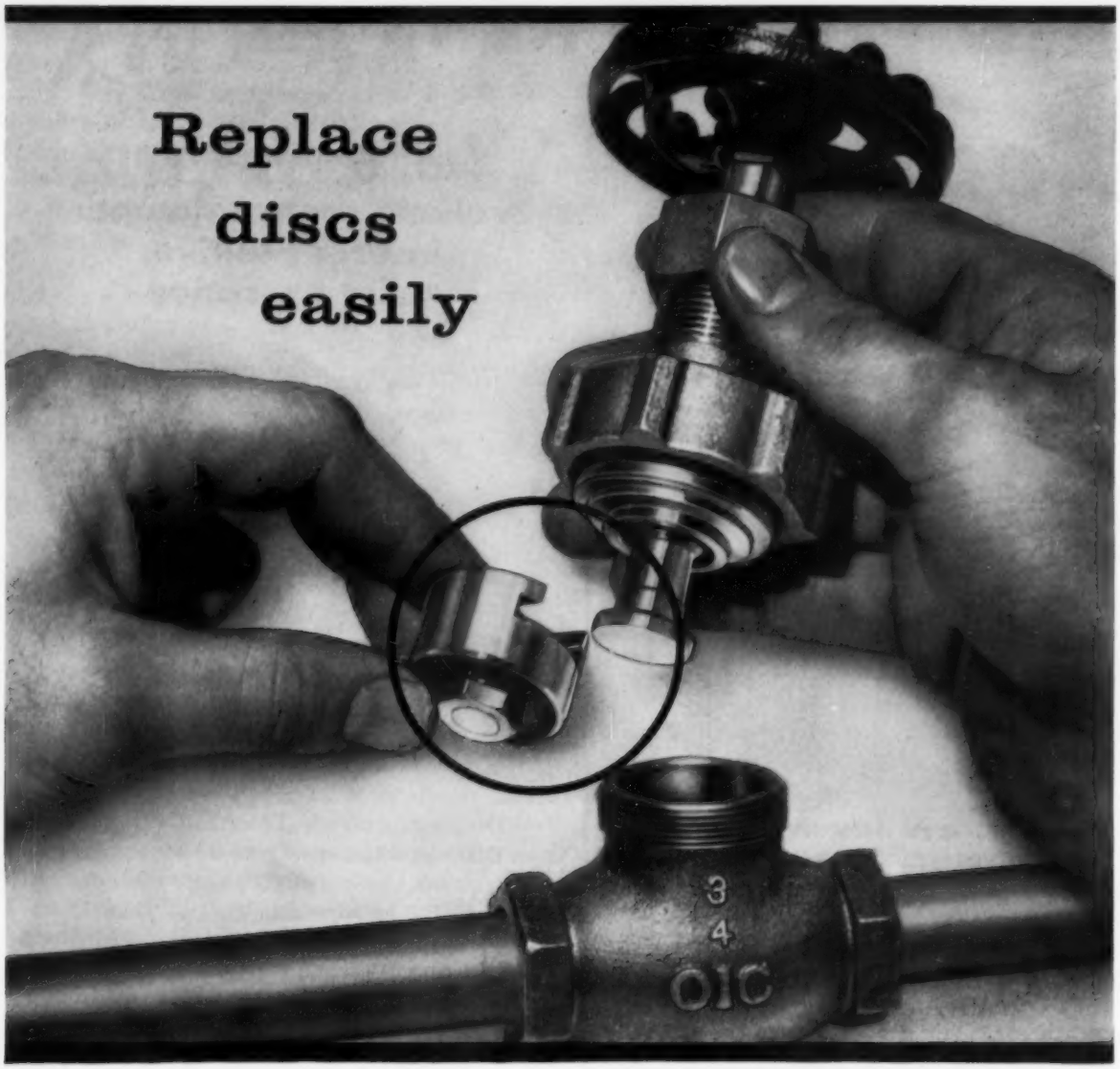


Fig. No. 520, 200 lbs. WSP, @400°F. 400 lbs. cold WOG, non-shock

It takes two minutes or less! Simply break the union joint and slip a replacement disc holder onto the button-head of the stem. Or, replace the disc only.

Additional features of this OIC line greatly reduce the need for other maintenance. For example: (1) The modern union body-bonnet joint assures a safe, tight, leakproof seal which is not affected by frequent dismantlings. (2) The special OIC *alloy-40* stem material eliminates galling and seizing. (3) Molded, graphite-asbestos, plastic packing is used which seals without hardening or cracking in service.

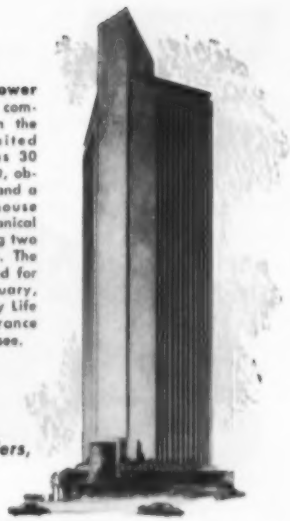
Reduce your valve problems by installing this OIC line wherever you need bronze globe and angle valves with composition discs. Call your OIC Distributor for more facts, or write for Form No. 1001 which describes the entire OIC 500 line with composition discs, as well as spherical and plug-type discs in globes, angles and checks.

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | **FORGED & CAST STEEL, BRONZE & IRON, LUBRICATED PLUG VALVES**

P-508

You can put a VP boiler ANYWHERE!



Life and Casualty Tower will be the tallest commercial structure in the southeastern United States. It contains 30 floors plus basement, observation platform and a three-story penthouse containing the mechanical equipment—including two VP package boilers. The building is scheduled for occupancy in January, 1957. It is owned by Life and Casualty Insurance Company of Tennessee.

. . . anywhere the floor-loading's adequate, of course. In Nashville's nearly-finished Life and Casualty Tower, two Combustion Engineering Package Boilers, Type VP, were installed in a 32nd-floor penthouse — nearly 400 feet above the street. The pictures show how the job was done.

Take It Away — First of two VP Boilers — 27,000 pounds — clears the truck bed in the first step of its 32-story journey. VP Boilers come fully assembled, ready for water, rail or road shipment anywhere in the world.

Almost Home — This VP has probably shattered the altitude record for boilers now — and it has another 30 or 40 feet yet to go. That's one of the advantages of the VP. You pick the spot and the rigging boys will find a way to move it in.

Boiler in a Penthouse — Now it's almost settled in its permanent skytop home; about set to bring up number 2. When the floor is ready, they'll hook up fuel, water and the job's done. They'll burn gas in these boilers, with oil as stand-by.

The completely shop-assembled VP Boiler, shown at left, is available in fourteen sizes from 4,000 to 40,000 lb steam per hr ... for operating pressures up to 500 psi ... for pressure firing of liquid or gaseous fuels. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The larger lower drum — 30-inch diameter — permits a simple, symmetrical tube arrangement ... greater water storage capacity ... easy access for washing down or inspection. A low speed centrifugal fan which is exceptionally quiet in operation is standard equipment. The simple baffle arrangement results in low draft loss ... simple soot blowing ... no dead pockets ... high heat absorption. The VP is enclosed in a reinforced, gas-tight, welded steel casing, and shipped completely assembled with firing equipment, fittings and forced draft fan. For foundation, the VP Boiler requires only a simple concrete slab.

C-E **COMBUSTION ENGINEERING**

8-9288

Combustion Engineering Building • 200 Madison Avenue, New York 16, N.Y.
Canada: Combustion Engineering-Superheater Ltd.

Steam Generating Units • Nuclear Reactors • Paper Mill Equipment • Pulverizers • Flash Drying Systems • Pressure Vessels • Home Heating and Cooling Units • Domestic Water Heaters • Soil Pipe

SKIDMORE PUMPS — *set the pace in performance**

Featuring—mechanical shaft seal

dependable performance

quiet operation

NEW BULLETIN NO. 21-B

send for your copy

Make sure you get all the advantages when you buy or specify heating pumps. The new SKIDMORE type CVS condensate pump offers the very last word in pump engineering—*Mechanical shaft seal . . . greater range of discharge pressures. Compact design . . . lightweight construction . . . quiet operation and dependable performance.*

TYPE CVS
DUPLEX UNIT

For heavy duty service specify a SKIDMORE CVS duplex unit. Above is shown pump with two floats and switches. Unit is also furnished with one float and mechanical automatic alternator to provide alternating operation of two pumps.

TYPE CVS
SINGLE UNIT

Here are the answers to— your Heating Pump Problems

*SKIDMORE PUMPS have set a standard for performance and dependability since 1921

SKIDMORE CORPORATION
ST. JOSEPH, MICHIGAN

New CARRIER Modular Units for office building air conditioning—as little as one foot high!

Now the world's finest air conditioning system—the Carrier Weathermaster* System—offers a new modular under-the-window unit as little as one foot high! For modern all-glass buildings, it gives new freedom in design never before possible with a perimeter air conditioning system!

If you want large windows that extend almost to the floor, now you can have them—WITH WEATHERMASTER AIR CONDITIONING! New Carrier Modular Units hug the floor—look like a decorative ledge only one foot high, ten inches deep.

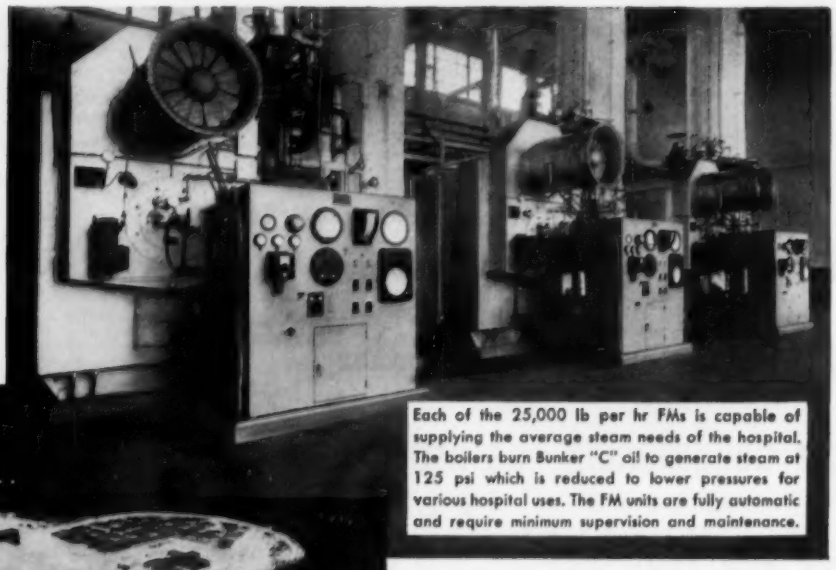
If you want an air conditioning system that fits the building you design instead of having to design a building to fit the air conditioning, now you can have it—WITH WEATHERMASTER AIR CONDITIONING! Small, compact units are designed to fit modern building modules—with trim enclosures that can extend from column to column or wall to wall.

If you want to save space and materials without sacrificing air conditioning performance, now you can do it—WITH WEATHERMASTER AIR CONDITIONING! Carrier Modular Units save on ductwork. Fewer vertical risers are needed. The air supply can be extended through handsome enclosures to units in series. Air and water connections can be made at the bottom or either side.

Find out more about the new Carrier Modular Weathermaster Units. And find out more about the famous Weathermaster System that lets you control the climate you prefer in every room—quietly, quickly, automatically. Call the Carrier office listed in your telephone directory, or write for Catalog 36N-64. Carrier Corporation, Syracuse, New York.

*Reg. U.S. Pat. Off.

Carrier air conditioning • refrigeration • industrial heating



Each of the 25,000 lb per hr FMs is capable of supplying the average steam needs of the hospital. The boilers burn Bunker "C" oil to generate steam at 125 psi which is reduced to lower pressures for various hospital uses. The FM units are fully automatic and require minimum supervision and maintenance.

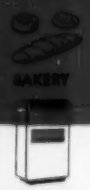
cutting steam costs . . .

Airview of Ancora indicates size and facilities of this ultra-modern medical center. Its 800 professional staff members will serve 2700 patients housed in 22 major buildings.

For all steam needs

NEW JERSEY STATE HOSPITAL

depends on 3 B&W FM Boilers



Three B&W Integral-Furnace Boilers are used to assure the reliable steam source required by this huge new medical center at Ancora, N. J. The FMs supply steam through a 6-mile, high-pressure steam main to a coordinated system of fresh-air conditioning, heating, and ventilating, that provides the ideal environmental conditions considered essential to the recovery of patients. In addition, FM steam supplies the large laundry, kitchen, bakery, and sterilizing requirements throughout the institution's 22 major buildings. Sufficient steam capacity was engineered into the hospital plans by Charles Simkin & Sons, Inc., Engineering Contractors, to provide for possible future expansion.

Ancora is the latest hospital to "go FM," joining a long and fast-growing list of institutional, commerical, industrial, and residential users who insist upon the most dependable, efficient, and economical supply of steam. Available in standard sizes up to 40,000 lb of steam per hr and pressures to 235 psi, the B &W FM Boiler is also in service with moderate superheat and for higher operating pressures. For complete details write The Babcock & Wilcox Co., Boiler Division, 161 East 42nd Street, New York 17, N. Y.

CHECK THESE FM SAVINGS FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

G-745

BABCOCK & WILCOX

BOILER DIVISION

Plan New Edition of Code For Pressure Piping

. . . in seven sections

PLANS for publishing a revised edition of the Code for Pressure Piping, B31—, in seven sections, each in a separate book, are now under way, according to the American Society of Mechanical Engineers.

All material on district heating will be combined with the section on power piping. Material now handled through cross references to other sections will be included in each section and cross references eliminated.

The seven sections will cover: (1) Power piping, including district heating; (2) Industrial gas and air piping; (3) Oil refinery piping; (4) Refrigeration piping; (5) Gas transmission piping; (6) Oil transmission piping; (7) Chemical piping.

All sections will be numbered according to a uniform outline. A decimal classification system has been worked out and titles have been assigned to the paragraph numbers. ⫩

92 F Heat Idles 6000 Chrysler Workers

. . . some strike, rest sent home

SIX THOUSAND Chrysler Corp. workers were sent home from the company's Kercheval and Jefferson plants one day during the summer's first heat wave after 13 painters walked out when the temperature hit 92 F. The heat strike and employee exodus occurred at the same time that 9960 workers in two other plants were idled by a walkout of 1100, protesting discharge of two union stewards. ⫩

Steel Boiler Sales Rise 2 Percent Above 1955

. . . supply of plate tight

WITH sales of steel boilers currently running ahead of last year, manufacturers anticipate another good year in 1956, according to R. A. Locke, president and manager of the Steel Boiler Institute, Inc. Sales for the first quarter of this year were 2 percent above sales for the 1955 period.

With building permits in excess of last year, and with the continuation of a heavy volume of industrial, commercial, and institutional construction, Mr. Locke predicts that sales for the year will exceed sales in 1955.

He points out, however, that the amount of steel now available is very tight and that many companies are in need of plate. "Conditions are similar to what they were during World War II and definitely worse than they were during the 'police action' in Korea, he says. ⫩

Air Filter Commercial Standard Recommended

. . . for adoption by industry

A RECOMMENDED *Commercial Standard for Testing and Evaluating Mechanical Air Filtering Devices of the Unit Type Used in General Ventilation* was circulated to industry for acceptance under date of May 21, according to the Commodity Standards Division of the U.S. Department of Commerce.

The standard was proposed by the Air Filter Institute, and contains the same general information as the article, *Here's Detailed Explanation of AFI's New Air Filter Code*, by A. Nutting and R. F. Logsdon in the June 1953 HPAC, pp. 77-82. Some adjustments have been made in accordance with other interests, wherever practicable.

The proposed commercial standard provides a gravimetric test method, using synthetic dust, for evaluating the performance of unit type mechanical air filtering devices of the viscous impingement and dry types. It also presents a method of making uniform performance reports of the results of tests. The preface to the standard outlines the industry problem and the suggested means of meeting it.

Copies — designated TS-5315 — of the recommended commercial standard may be obtained from H. A. Bonnet, Commodity Standards Division, U. S. Dept. of Commerce, Washington 25, D. C. ⫩

Record Contract Awards Set in First Four Months

. . . April awards up 4 percent

CONTINUING strong demand for building and engineering structures boosted contract awards for future construction in the 37 eastern states to a total of $2,421,497,000 in April, according to the F. W. Dodge Corp. This was a record April, up 4 percent over April 1955, and the second highest contract figure for any month in Dodge history. (May 1951, in which $980 million Atomic Energy Commission awards were let, was the highest.)

Also, a new first four-month record of $8,521,369,000 was established. This was 13 percent greater than that of the 1955 period.

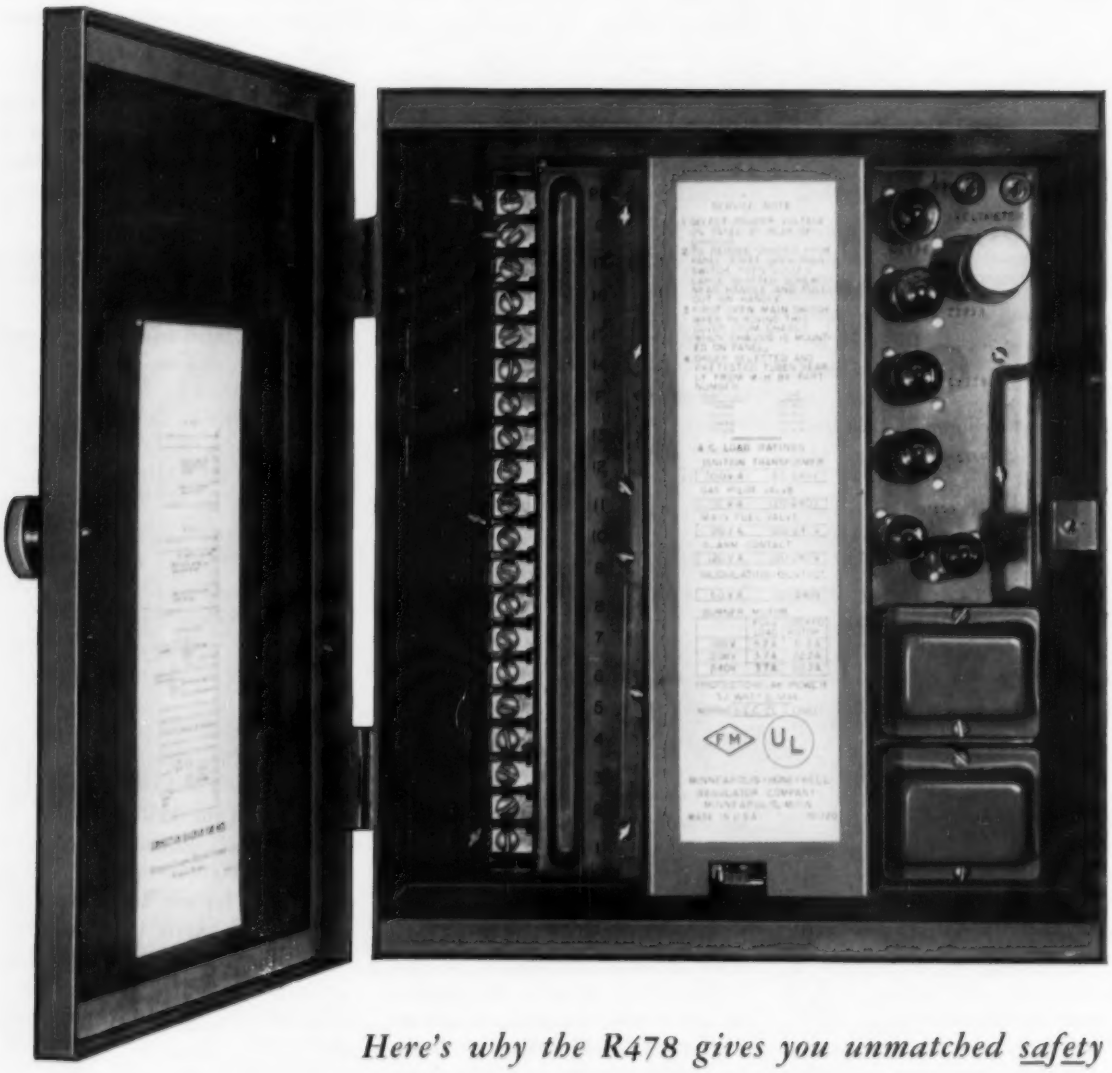
The April residential figure of $1,144,160,000, by a small margin the greatest for any month, was up 7 percent over April 1955.

Nonresidential contract awards also set a new record for the month at $821,549,000, up 16 percent over April 1955.

Although heavy engineering contracts at $455,788,000 were down 17 percent, compared to April 1955, the total was greater than March 1956.

Major construction categories also set first four-month records. Nonresidential at $2,993,989,000 was up 17 percent over first four months 1955; residential at $3,743,188,000 was up 8 percent; and heavy engineering at $1,784,192,000 was up 20 percent over the 1955 period. ⫩

NEW from Honeywell *–for commercial oil,*



Here's why the R478 gives you unmatched safety

THE NEW R478 Protectorelay* assures you a safe start, component check after each power failure, regardless of length or cause of interruption. Every time power returns, the electronic network must prove itself to be in proper operating sequence before the Protectorelay is allowed to continue normal operation. In addition, the safe start component check circuit still provides component check on each burner operation. The R478 responds instantly to flame failure, providing immediate burner shutdown and post purge.

Shown in the photograph above is the R478B, for lead sulphide applications. The R478A, for rectification circuits, is similar in appearance.

*Trademark

gas and combination gas-oil burners

UNMATCHED FLEXIBILITY AND PERFORMANCE IN A FLAME SAFEGUARD!

New R478 Protectorelay lets you give your customers exactly what they want—

- ***Choice of flame detection***—R478A for flame rectification (flame sensing rod and photo cell). R478B for Flameguard (lead sulphide cell).
- ***Choice of burner sequencing***—choose from:
  - Pre-purge period either 5 or 30 seconds.
  - Proved or unproved pilot or direct ignition.
  - Intermittent or interrupted pilot.
  - Ignition timing either 15 or 60 seconds.
  - Low fire start with return to firing rate control either when main fuel valve opens or at end of ignition period.

  In combination gas-oil burners one sequence can be selected for gas firing, another for oil firing.
- ***Choice of manual or automatic starting.***
- ***Wide selection of voltage***—120, 208 or 240-volt 60 cycle applications. Separate model available for 50 cycle.
- ***Broad range of applications***—precision engineered for large conversion burners—such as horizontal rotary, mechanical, air or steam atomizing and forced draft gas—also for steam generators and floor standing heaters.
- ***Fast, dependable electronic detection and timing***—R478 responds *instantly* to flame failure. Then, vacuum-tube rectifiers assure uniform electronic timing of sequences.
- ***Easy to install.***
- ***Lower maintenance costs***—Time-proven Honeywell components—unaffected by friction, dust or corrosion—assure constant efficient operation.

Honeywell manufactures a complete line of heating controls for all types of oil and gas burners. For information on the R478 or on any of our other controls, call your local Honeywell office. Or, write Dept. HA-7-145, Minneapolis 8, Minnesota.

MINNEAPOLIS **Honeywell**

112 offices across the nation

First in Controls

Extravagant Claims Impede Progress

. . . in air conditioning industry

"EXTRAVAGANT CLAIMS" by some companies in the air conditioning industry are misleading the public, "creating dissatisfied customers and impeding progress," according to the newly elected president of the Air Conditioning and Refrigeration Institute.

Matthew M. Lawler said in an inaugural statement recently that the industry must act on the problem because "any industry that cannot police itself from inside will eventually be policed from outside. . ."

Mr. Lawler, vice president of Worthington Corp.'s air conditioning and refrigeration division, said, "Something must be done to insure the integrity of manufacturers' ratings of equipment."

The Institute has appointed a committee to study certification programs used by other industries as one step to combat the problem. ⫩

Report New Ways to Reduce Air Pollution

. . . at recent meeting

HIGHLY EFFECTIVE air filtration systems are increasingly needed in specific areas of hospitals, such as operating rooms, said Herbert M. Decker, of the U.S. Army Chemical Corps, at the 49th annual meeting of the Air Pollution Control Association in Buffalo, N. Y.

"Spun glass pads are satisfactory in all ordinary situations," he said, "but in extremely specialized circumstances — as in the case of some research institution where unusual numbers of disease producing organisms are handled in large numbers and accidentally or deliberately released into the air — incineration or use of glass paper filters is recommended."

He also urged attention to the types of air pressurization systems which must be maintained if a satisfactory biological-free condition is to be achieved.

Roy A. Updegraff, project engineer for Bituminous Coal Research, Inc., reported that 200 tests in the BCR laboratory in Columbus, Ohio, show that stack spray dust collectors can collect 60 to 70 percent of the suspended fly ash and dust emitted from coal fired boilers.

In Los Angeles, air paths associated with heavy pollution concentrations have been traced by wind reports from 64 stations. Edwin K. Kauper, senior meteorologist with the Los Angeles County Air Pollution Control District, said that trajectories for heavy smog situations from 1952 to 1955 have forced a re-evaluation of pollution sources since nearly all cases indicate a flow over predominantly residential rather than industrial sections. ⫩

Filter Media Trims Float

FIRST PRIZE FLOAT in the commercial division of the this year's Kentucky Derby Festival parade in Louisville, Ky., was entered by American Air Filter Co., Inc. Different colored glass fiber filter media was used to decorate the unusual and gaily colored float

Air Condition St. Moritz Hotel with Central Plant

. . . hailed as setting trend

A CENTRAL air conditioning plant recently put into operation in the 25 year old, 33-story St. Moritz hotel, New York, was acclaimed a pioneer in leading the trend towards central air conditioning of New York's major hotels by Gilbert A. Peck, eastern regional business manager of the Carrier Corp.'s unitary division.

At ceremonies marking the system's beginning of operation, Mr. Peck likened the installation of central cooling in the hotel to the day when central radiator heating replaced the pot belly stove. "I think this newest development is clear evidence that the day is coming when all the better hotels in the metropolitan area will find it essential to provide complete year 'round air conditioning," he said.

The ceremonies marked the completion of Phase I of the hotel's program, which will shortly see 100 percent of the 600 guest rooms air conditioned. Half of the rooms are now conditioned. Phase II is already under way.

Fan coil units installed under each window provide individual room control.

The consulting engineer is William P. Henszey. Air conditioning contractors are Kerby Saunders, Inc. ⫩

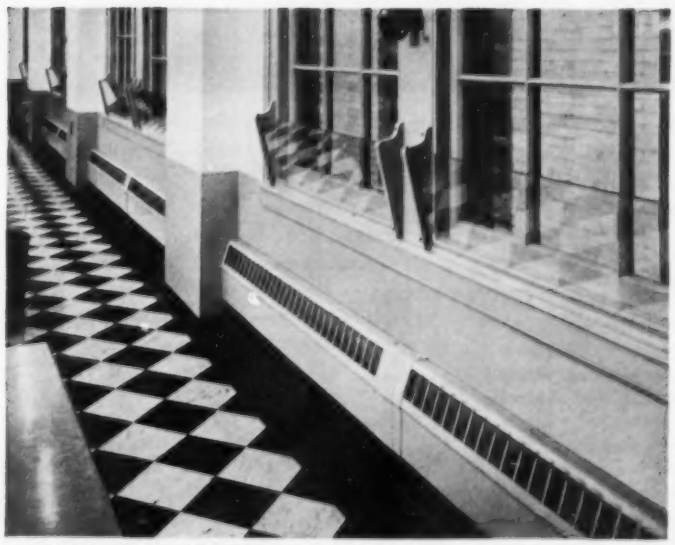
"Quote"

"We must take into account climate."
—Hippocrates, Greek physician and "father of medicine," born 460 B.C.

WEBSTER BASEBOARD HEATING, in conference room of Textile Machine Works, Reading, Pa.

A
New Concept
in
Wall-To-Wall
Comfort

Tru-Perimeter Heating



WEBSTER WALVECTOR, in offices of Textile Machine Works, Reading, Pa.

Webster Tru-Perimeter Heating – with steam or forced hot water – creates a barrier of gentle warmth against the incoming cold along every exposed wall, in modern buildings everywhere. Webster Tru-Perimeter Heating provides uniform warmth with minimum floor-to-ceiling temperature difference, assures minimum fuel cost, sacrifices no usable floor space.

Webster Tru-Perimeter Heating meets all requirements:

- Webster Walvector with newly-styled and improved enclosure meets the requirements for most non-residential buildings;
- Custom Webster Walvector designed for complete buildings achieves economy in first cost by effectively coordinating heating applications with building design;
- Webster Baseboard Heating serves residential and many other buildings.

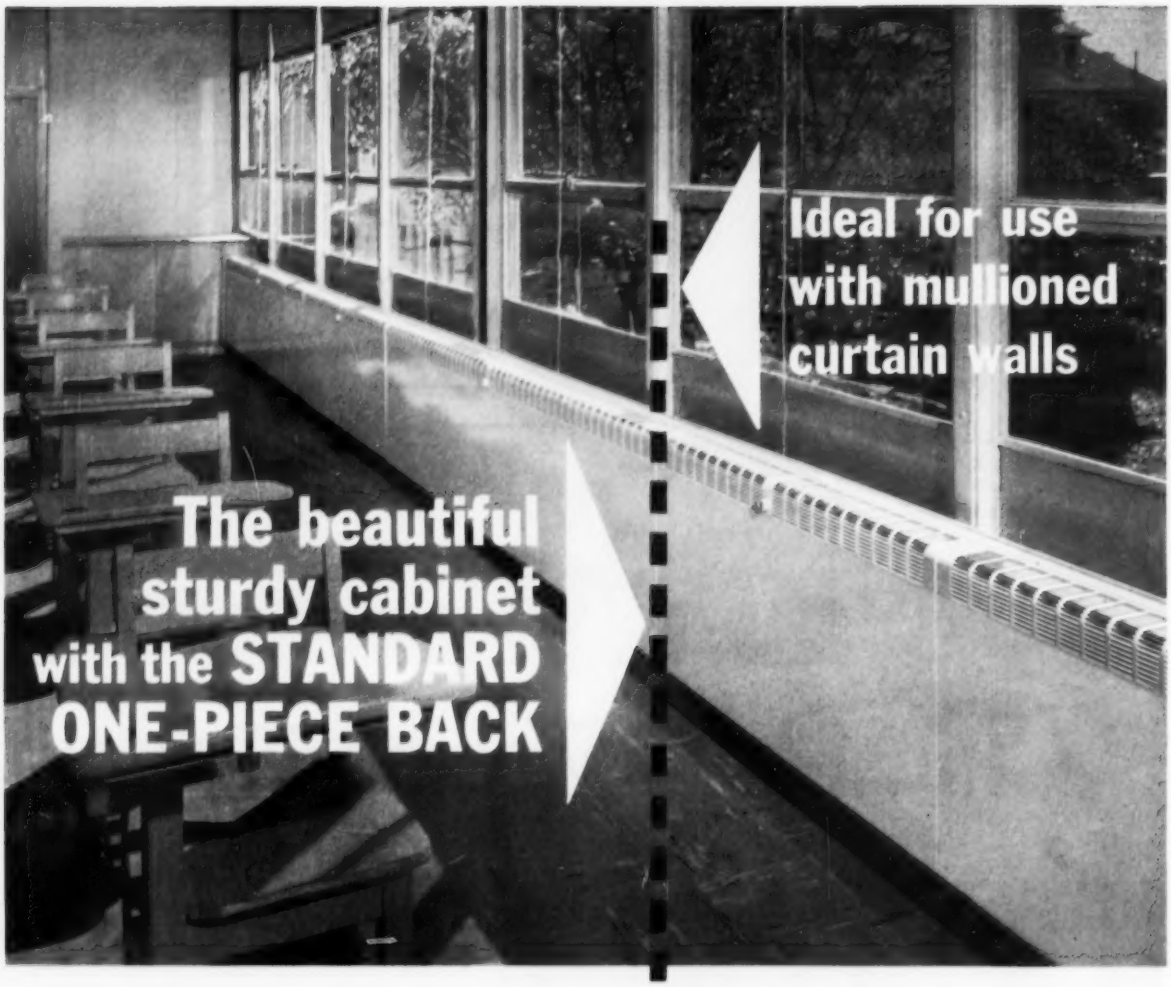
Webster Tru-Perimeter Heating teams with air conditioning for year-round heating and cooling comfort. For Tru-Perimeter Heating advantages, see your Webster Representative, or write us.

Address Dept. HP-7

WARREN WEBSTER & COMPANY
Camden 5, New Jersey

LOCATED NEAR YOU — TO HELP YOU. Webster Representatives in these 66 U.S. Cities: Albany, Atlanta, Atlantic City, Baltimore, Bethlehem (Pa.), Birmingham, Boston, Buffalo, Butte, Charleston (W. Va.), Chattanooga, Chicago, Cincinnati, Cleveland, Columbia, Columbus, Dallas, Davenport, Dayton, Denver, Des Moines, Detroit, Grand Rapids, Harrisburg, Houston, Indianapolis, Kansas City, Kingston (Pa.), La Porte (Ind.), Little Rock, Los Angeles, Louisville, Lubbock, Memphis, Milwaukee, Minneapolis, Nashville, Newark, New Haven, New Orleans, New York, Oklahoma City, Omaha, Orlando, Philadelphia, Pittsburgh, Portland, Raleigh, Richmond, Roanoke, Rochester, Saginaw, St. Louis, Salt Lake City, San Antonio, San Francisco, Seattle, Spokane, Springfield, Syracuse, Toledo, Trenton, Tulsa, Washington, Wichita, Wilmington.
In Canada, Darling Brothers, Ltd., Montreal.

Webster
WALVECTOR
REG. U.S. PAT. OFF.
For Steam or Hot Water Heating

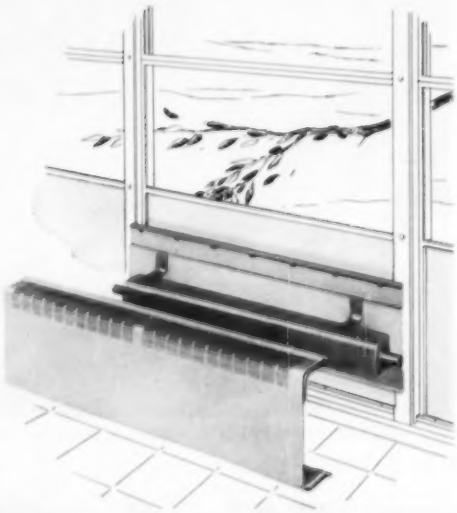


"Let there be light!" say the occupants of today's offices, schools, hospitals . . . "Let there be speed and economy!" say today's builders. So, we have prefab window walls.

"Let there be thermal protection against the larger cold surfaces!" And so, we have today's perimeter radiation.

Nesbitt Sill-line ranks first—not alone for its beauty and comfort, but as well for its economy of installation.

Sill-line's versatility begins with its standard "backbone construction"—the one-piece, 20-gauge back panel which spans mullioned walls, saves on face material, and insures trueness and rigidity. Heating elements, with sized-to-mate tube ends, are quickly sweat-jointed and suspended. The 16-gauge, die-formed front locks full length top and bottom. With standard lengths, sleeves, and accessories, any space may be fitted without cutting—even wall-to-wall and in and around corners. Why not send for Publication 102.



BACKBONE

CONSTRUCTION

Nesbitt SILL-LINE

The World's Most Beautiful Perimeter Radiation

NESBITT SILL-LINE RADIATION IS MADE AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PENNSYLVANIA

"Open for Discussion"

• WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Pipe Specification, Procurement for Central Stations Is Common Problem

DIFFICULTIES in the specification and procurement of pipe for large high pressure, high temperature power plant installations are common experiences, as Frank A. Ritchings and Sabin Crocker point out in their paper on central station piping trends presented at the 18th annual American Power Conference and published in the April HPAC.

The rapid growth of the power industry in the last decade, the consequent tight construction schedules, and the relatively small tonnages of pipe required for the various uses have created procurement and delivery difficulties. Some users faced with supply or delivery problems have turned to foreign suppliers.

Before purchasing pipe abroad, it is advisable to investigate the producer's facilities, the steel making and manufacturing processes, testing laboratory facilities, and ability to fulfill the requirements of the specification as to chemistry, physical properties, heat treatment, and surface finish.

Since quotations for foreign pipe are usually based on delivery alongside ship at a foreign port, consideration should be given to such additional charges as duty, ocean and domestic freight, broker's fee, insurance, inspection, etc. These charges usually amount to 20 to 25 percent of the value of the pipe at the foreign port.

To avoid possible misunderstandings, the order should be very explicit in regard to the selection of options in the specification such as the process of steel manufacture, heat treatment, number of supplementary requirements, dimensional tolerances, pipe lengths, marking, protection for shipping, inspection, etc.

On pipe orders discussed below, a purchaser's inspector was present at the mill during all stages of manufacture to check on the material, interpret specifications, and expedite the work. Micrographs of the structure of representative samples were made, and creep and stress rupture tests are being made to determine the high temperature characteristics of these alloys.

On the basis of experience obtained to date, it is possible to purchase a satisfactory quality of alloy steel pipe from foreign sources, made by the pressed and drawn process with reasonable delivery time and at a favorable cost. Delivery time on orders cited below varied from four to five months, but in general the time depends on the mills' prior commitments.

Available from a number of foreign suppliers in England, Germany, Italy, and Japan is pipe made by the forged, turned, and bored, and the pressed and drawn processes, in large diameters, heavy walls, and to ASTM carbon and alloy steel specifications.

The following information of foreign made pipe is based on three orders of pressed and drawn pipe, one from Germany and two from Japan. The material was made to ASTM specifications for 1¼ percent chrome, ½ percent molybdenum, and 2¼ percent chrome, 1 percent molybdenum pipe.

The 2¼ percent chrome, 1 percent moly pipe from Germany was 17.5 in. and 21 in. outside diameters, with 3.125 in. and 3.75 in. walls, respectively, and in lengths of about 20 ft. The 1¼ percent chrome, ½ percent moly pipe was 24 in. OD, with 1.218 in. wall, and 20 in. OD with 1.031 in. wall in lengths to 21 ft.

The pipe from Japan consisted of 2¼ percent chrome, 1 percent moly, of 22 in., 21 in., and 17.5 in. OD, and 4.25 in., 3.75 in., and 3.125 in. walls, respectively, with lengths of about 20 ft, and 1¼ percent chrome, ½ percent moly, 24 in. and 20 in. OD with 1.218 in. and 1.031 in. walls, in lengths of 20 ft.

All of the above pipe was made by the pressed and drawn process, with the exception of the Japanese 17.5 in. OD, which was forged, turned, and bored. The pressed and drawn process is very similar to the domestic hollow forged process the authors describe.

In Japan, the steel for both grades of pipe was made by the basic electric furnace process, and conformed very well to the chemical requirements of the specification. The pipe was normalized and tempered, but due to a misinterpretation of the heat treating specification some of the yield strengths on the first order for pipe approached the minimum of 30,000 psi, so the pipe was reheat treated to improve this property.

Since all of the pipe was turned on the outside and bored on the inside, it was finished to very close tolerances. The specified internal diameter tolerance was +0 in., −0.031 in. The extreme variation from the nominal diameter actually obtained was −0.022 in. On wall thickness, the specified tolerance was −0 in., +0.125 in.; and the extreme variation from nominal was +0.058 in.

The pipe was machined on inside and outside to a 250 micro-inch finish, and ultrasonically tested.

In Germany, the 2¼ percent chrome, 1 percent moly pipe was made of basic electric furnace process steel, and the 1¼ percent chrome, ½ percent moly pipe was made of basic open hearth steel. Both grades were given a normalizing and tempering heat treat-

ment. The tensile strengths varied from 72,000 to 97,000 psi, and the yield strength from 43,000 to 72,000 psi. The straight lengths of pipe were retempered to reduce the wide range of the yield strengths; bent pipe received a heat treatment.

Pipe made by the German pressed and drawn process is sufficiently smooth so that it does not require internal boring. It is first pickled and then turned on the outside to required dimensions. It was purchased on the basis of ±1 percent tolerance on outside diameter, and ±6 percent on the wall thickness. As delivered, the maximum variations were +1 percent, −0.0 percent on outside diameter, and +5 percent, −0 percent on wall thickness. The outside finish was 250 micro-inch, and all pipe ultrasonically tested.

J. A. Blecki
Mechanical Engineer
The Detroit Edison Co.

Use Water Tight Envelope Bonded to Insulation That Won't Absorb Water

We read with interest the article, *Provide Good Drainage, Pure Fill for Best Efficiency of Conduit Insulation*, by Samuel R. Lewis in the January HPAC.

We agree with Mr. Lewis' statement that a sheet metal jacketed conduit can hardly be expected to remain water tight forever.

However, even when no drainage facilities are provided, the failure of the conduit insulation described can be positively prevented by the following methods:

1) *Use of an insulating material that does not readily absorb water.* Such a material when exposed to water will resist the movement of water and will dry out more quickly once the heat is turned on because comparatively little water has been absorbed.

2) *Use of a water tight envelope bonded directly to the insulation.* Such an envelope, either of dense concrete or asphaltic membranes, will not be subject to corrosion and can be expected to remain water tight indefinitely. Also if mechanical failures should occur, water will not flow in under the envelope and around the insulation. The insulation will be wetted only at the point of failure. Drying out will require little time.

Systems of underground streamline insulation having the above mentioned features have been used for several years. The insulation used is foam concrete, sometimes called cellular concrete, and is made from Portland cement, water, and a special type of foaming agent. This imparts a structure of noninterconnecting cells so that water transmission can take place only through capillary action in the walls of the concrete. The material is mixed and placed on the job and has a density of 16 to 18 lb per cu ft, oven dry, and has a thermal conductivity of 0.6 Btu per in. per F per hr per sq ft at a mean temperature of 70 F.

Michael Smolin
Research & Development Laboratories
Mearl Manufacturing Corp.

Consider Noise Problem, Operating Cost Of High Velocity Air Conditioning

I have read the article, *How We Started Doing High Velocity Air Conditioning*, by G. C. Savage, in the May HPAC, and wish to take exception to the general theme that a high velocty system is the best system that can be installed. Where the problem involves an existing building, it may be necessary to use the high velocity system in order to fit the system into the existing structure. In this case, the owner must make a sacrifice in operating costs, which are higher for this system than for a conventional system.

The author also emphasizes that a high velocity system is less noisy than a low velocity system. The fact is that any system can be designed for quiet operation. But it seems obvious that noise reduction problems are greater in a high velocity system because of higher tip speeds and velocities.

In the author's design of the high velocity systems for new buildings—especially for those including an air source heat pump—was adequate consideration given to the economic evaluation from the standpoint of operating costs?

Other than these points, many of the suggestions the author made are standard practice in high velocity design. I feel that the article in general was helpful to readers.

John Everetts, Jr.
Charles S. Leopold
Engineer

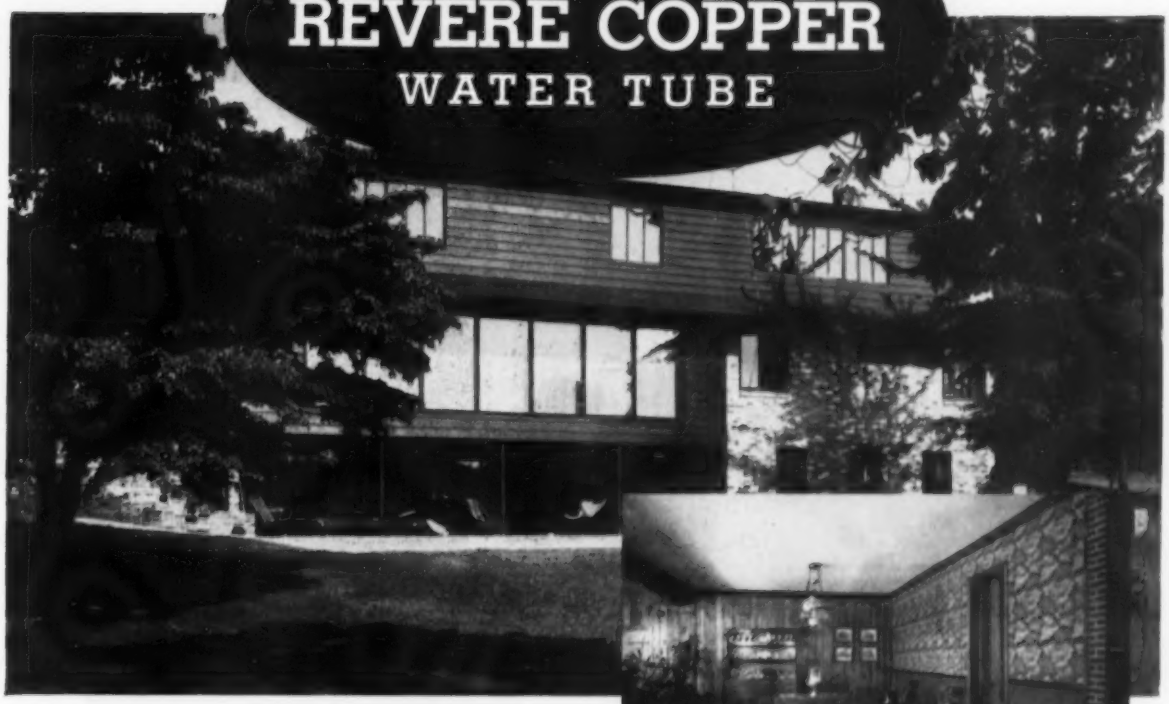
The Author's Reply—Either Mr. Everetts missed the point of my article, or I failed to put it across. This article was slanted, I hoped, toward those who had not yet tackled a high pressure job. It was an attempt to assure them that excellent results could be obtained and that the design of such a system was a reasonably simple matter.

As to consideration of operating costs, in every case a very thorough economic study was made, and in every case the owner and his architect were asked to weigh the problem and decide. In several cases the architect and owner made trips to other parts of the country, visited the latest installations of representative types of equipment, talked to owners and tenants, and observed operation. It is interesting to note that in each such case high pressure was the final selection because it had some very definite advantages to offer.

High pressure systems represent only a small part of our total work. We do many conventional, low pressure systems, and unit type jobs to every one high pressure system. But the fact remains, in spite of equal care and attention, the high pressure systems are the most satisfactory. I cannot help but feel that conventional low pressure will, in the not too distant future, find itself in the same category as the gravity warm air furnace.

G. C. Savage
Bevington, Taggart & Fowler, Inc.
Consulting Engineers

what they're doing with REVERE COPPER WATER TUBE



1,740 feet used for hot water heating and air conditioning lines in residence of Charles L. Humphries, Paducah, Kentucky

Architectural Engineer: G. ANTHONY JOHNSTON, Paducah
Builder: LESLIE FEAST, Paducah

An interesting feature of this residence is the combined winter heating and summer air conditioning system which has a boiler for winter use and a water chiller for summer use, with a transfer valve that diverts the water from one to the other as needed. Water is circulated through units that are in the rooms while fans blow air over the tubes in the units.

Said the Architectural Engineer, "I specified Revere Copper Water Tube for both of these systems because I knew the enduring and non-rusting qualities of copper would result in a satisfactory installation for my client." Said the Builder, "Using Revere Copper Water Tube upheld my reputation as a builder of quality homes and at the same time cost no more than rustable pipe." Said the Contractor, "I'm glad Revere Copper Water Tube was used for it's easy to work and handle and makes for a nice clean job."

Be smart! Play it safe with an all-copper installation. Use Revere Copper Water Tube for hot and cold water lines, air conditioning lines, radiant panel heating, underground service lines, drainage, waste and vent lines.

For more information on Revere building products send for 28-Page Booklet—"Building to Endure with Revere". It's free!

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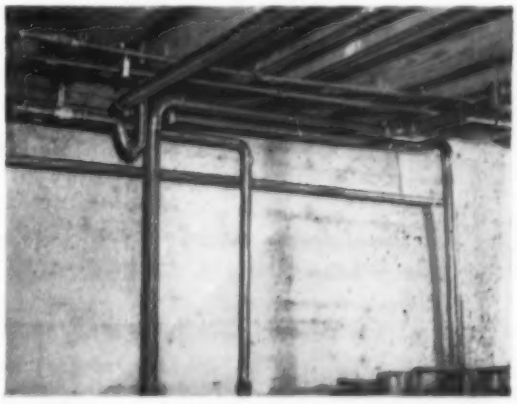
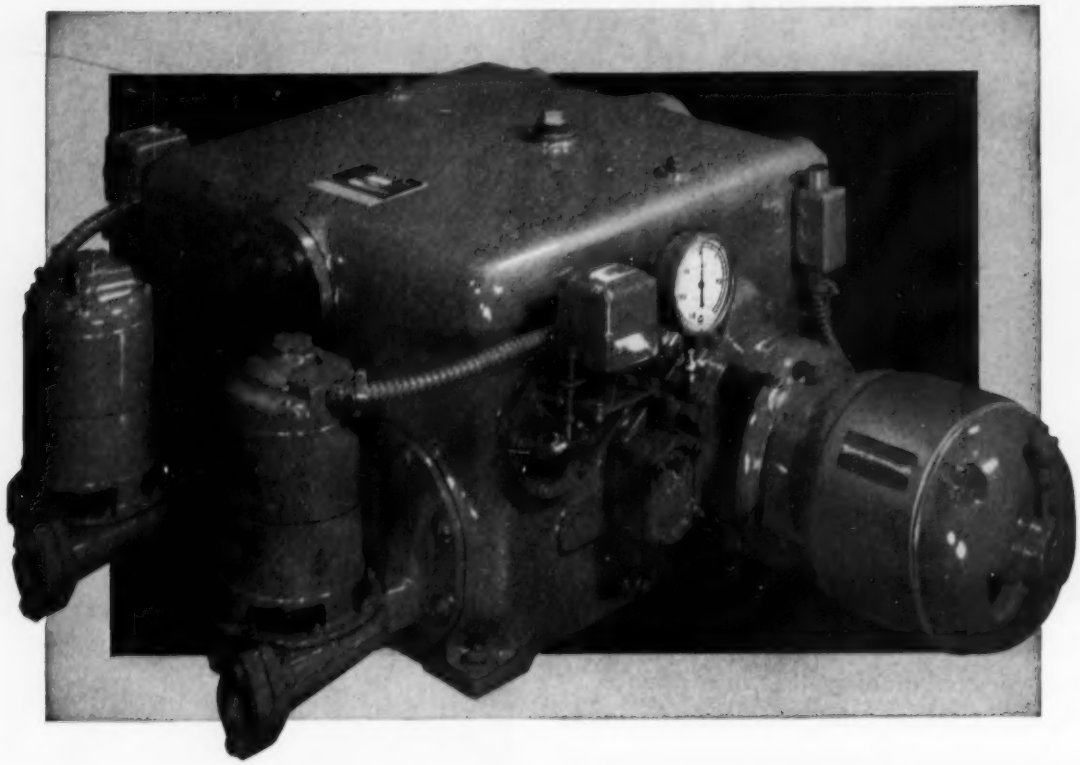
AT LOWER RIGHT in above photograph is one of the units which are used throughout the house. Revere Copper Water Tube carries hot water to the units in winter and cool water in the summer. Fans in the cabinets then circulate the hot or cool air, as the case may be, throughout the rooms.



No wrench-room worries here. Easy-to-solder Revere Copper Water Tube can be fitted into the tightest corner. Vertical lines shown come from the water chiller. G&H PLUMBING & HEATING COMPANY, Paducah, was the Contractor who installed the 1,740' of non-rusting Revere Copper Water Tube in sizes from ⅜" to 2". Tube was furnished by the HOE SUPPLY COMPANY, Paducah, Revere Distributor.

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

PIPE LINE BEGINS at offshore gas-oil separator facilities consisting of four huge permanent platforms. Right to left: pump and compressor unit, living quarters, oil storage unit, and separator unit

Longest Offshore Pipe Line Goes Into Operation

. . . moves 12,000 bbl of oil and 10.5 million cu ft of gas daily from below the Gulf of Mexico to a separation-distribution terminal 48 miles away.

By R. H. Illingworth, W. L. Montgomery, Clyde Aldridge, and C. V. Temple

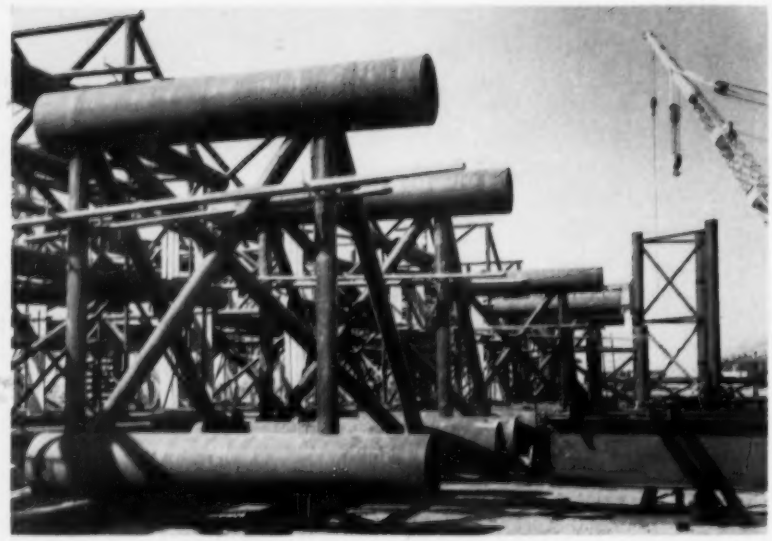
Magnolia Petroleum Co.

• Insulated and coated with reinforced concrete, the 12 in. diameter, welded pipe line is buried below the silt line.

• Feeder lines from several adjacent submerged oil fields enter the transmission line through a complex, versatile system of piping headers, manifolds, tanks, and separators on a central separator station platform.

• Here's the story of how the facilities were designed and installed.

THE WORLD'S LONGEST offshore pipe line, recently completed off the Louisiana coast in the Gulf of Mexico, is now in operation. The 48 mile, 12 in. line, with an ultimate capacity of 60,000 bbl of oil per day, carries oil and gas directly from feeder lines at well platforms to Burns terminal, St. Mary parish, La. It is officially known as the "Eugene Island Fields Flowline System." Total cost of the



PREFAB PIPE SECTIONS of wrought iron — shown here before installation — protect three-pile dolphins against corrosion of salt water and air in the highly corrosive zones a few feet above and below sea level. The metal, which is used for diagonal and horizontal bracings of the three-pile dolphins and three-pile clusters, also serves as bumper strips for loading docks. Photo courtesy A. M. Byers Co.

complete undertaking is estimated at $7 million.

The first offshore oil well was completed in the area in 1950 by Magnolia Petroleum Co., now operators for the joint interest with Continental Oil Co. and the Nemount Oil Co. Oil was transported to the terminal by barges. As production increased, it became evident that barging was undesirable because of its high cost per barrel and frequent interruptions. Also, prohibitive cost limited offshore storage to two 5000 bbl tanks. Thus, filled storage tanks in bad weather or rough water — when the barges could not tie up for loading — curtailed production as much as 20 to 25 percent.

Therefore, early in 1952, an engineering study was made to determine the practicability of offshore production-gathering facilities and a pipe line to shore. This study, and a number of others, showed that such a pipe line was feasible, despite little precedent to go by. This line was completed a few months ago.

Both Oil and Gas Carried

The installation is unusual in that it carries both oil and gas. These products have been co-mingled before in pipe lines, but never in a line of this size and in a system connecting several fields.

After being tested with salt water and cleaned, the flow line was connected to four wells and then later to 16 more. Eventually, the pipe line will be extended to another field eight miles southwest of the line's present limit.

The drilling platforms for the deeper wells — 9000 to 13,000 ft — have four wells each, or eight completions if completed as duals; platforms for the shallow wells — 5000 to 9000 ft — have seven wells each dually completed, or 14 completions per platform.

Each completion at the well head is equipped with high and low pressure shutdown valve, in case of a line break or to close the well in if the automatic controls on the separator platform should for some reason close down. Downstream from these valves, provision is made for water knockouts as needed.

Individual flow lines carry the well streams to the separator station. These lines are 3 in. ID — based upon the latest two-phase flow information — to reduce the pressure drop to a minimum. They are designed for 3000 psi working pressure to provide well control at the separator platform. Individual flow lines were decided upon for centralized well regulation for lower costs, better well testing, and reservoir control.

Brace Structures with Pipe

Structures required in the cycle of operations include a 98 × 136 ft separator platform, 50 × 100 ft oil storage platform, 72 × 141 ft combined pump and compressor platform, and a 44 × 87 ft living quarters platform. All structures except the living quarters platform are constructed with concrete templet and concrete piling. The living quarters platform is supported by steel caissons protected against corrosion by an 8 ft high sheath of monel in the tide zone.

Design loads for the respective structures include structure dead load, maximum equipment operating live load, plus maximum combination of wind and wave loads on structures and equipment under an estimated 125 mph hurricane wind.

Each concrete structure is made up of the necessary number of prestressed concrete pilings required to carry the total axial and lateral load transmitted to the structure. In each case, the templet part of the structure is made up of a number of templet sections. In all structures, each templet section is made up of six 54 in. OD × 48 in. ID cylinder piles each 64 ft in length. Each templet sleeve is prestressed with 12 cables of 12 No. 6 wires per cable stressed to 150,000 psig. The respective templet columns or sleeves are tied together by wrought iron pipe bracing in an appropriate pattern in horizontal and vertical planes. Prior to incorporation into the templet, the bracing pipe was wrapped with wire mesh and coated with concrete coating applied by a commonly used spinning or rotating process. Several inches of the pipe bracing were left uncoated to facilitate welding of the bracing to the jacket sleeves. In the fabrication and spinning of pipe for the templet sleeves, metal bands of appropriate thickness and width were

fabricated into the concrete cylinder pile which was used for the templet sleeves. To these sleeves the pipe bracing was welded in the process of templet fabrication. After joining of the jacket sleeves with the bracing, all exposed steel joints were wrapped with wire mesh and a concrete coating applied.

The platform structures are connected by a system of bridges requiring two intermediate supports; each support is comprised of four 36 in. OD, 28 in. ID prestressed concrete cylinder piles. Bridge sections are approximately 80 ft in length, resulting in approximate spans of 90 ft. This gives a clearance between each structure and any adjoining juncture point of the interconnecting bridge system of approximately 80 ft. This results in greater safety in the event of fire or unforeseen damage to any given structure. The location selected for the oil storage platform provides the maximum safety to adjoining structures in the case of a fire at the oil storage platform.

Fire hydrants are on all structures in addition to emergency hand fire-fighting equipment. Water pressure is supplied from a central fire pump which takes water from the ocean. Each structure has an emergency life raft that may be launched in a matter of seconds. Boat landings and mooring facilities are selected and designed with a view to maximum safety. For protection from marine vessels, a ring of lights outlines the structure group. The structures are protected in foggy weather by compressed air fog horns.

Pre-fab Piping on Shore

Flow lines have a double choke entry so that a minimum of time and effort is consumed in changing chokes; also it is necessary to shut in the wells, particularly the ones at a critical flowing state. The headers are so arranged that two methods of flow can be handled:

1) In the early stages of development, directly into the two-phase — oil and gas — line.

2) Later, when the 12 in. line to shore becomes loaded under two-phase flow and it is necessary to separate the oil and gas to increase the oil capacity of the line, or to reduce line pressure for the weaker wells.

LAYING PIPE LINE, crew applies insulation and concrete coat to joint after welding concrete-coated sections of pipe on barge. The line is buried along its entire length to protect it from a marine borer and from dynamiting by exploration crews

Some of the deeper wells are capable of flowing against 1500 psig separator pressure having flowing pressures of 1700 to 2000 psig, while the shallow wells have flowing pressures between 800 and 1100 psig approximately. With these pressures available, it will become possible to use three-stage separation — 1500, 750, and 350 psig or lower — as the wells decline.

To reduce costs and obtain better workmanship, prefabrication of all heavy separator platform equipment onshore was necessary.

Separator banks — in units of four and three — were assembled completely onshore in convenient sizes with all of the related piping and valving not subject to damage by rough handling. The well manifolds and choke headers and diaphragm control valves were assembled in sections. The main headers, other tanks, and manifolding were constructed in the same manner. When the sections were placed on the platform, a minimum of connection work was required.

All the separators are equipped with outside dual purpose controls for regulating the dump valves and operating the high liquid level controls. They also have water sections with valves operated by an outside float control.

The oil headers are designed so that any well or group of wells can be switched into the test separator or the high stage separator where the separated gas will go to the high pressure header and the oil to the next stage separator. In turn, low pressure wells can be directed to the last stage, the gas to the low pressure header, and the oil from all stages to the low pressure oil line which leads to low pressure separators. This line operates at a pressure as low as feasible, so that the minimum amount of gas goes over to the storage or pickup tanks with the oil; any remaining gas is vented at a safe distance.

The prohibitive cost of storage necessitated keeping it down to operating requirements. The two 5000 bbl transfer tanks provide storage for only minor interruptions caused by pipe line pump adjustments and repairs.

Each separator has dual relief valves and is connected to the blow-

down line; the popped gas is carried off the platform to a safe distance.

Diaphragm control valves are the most important safety device incorporated in the design, for they are used to shut the wells automatically, which may be necessary from a number of causes. These valves are of the air open-spring close type, which will close upon any failure or interruption of the air supply.

The working area is kept as free from escaping gas as is practical during normal operations.

One of the principal reasons for the central separator station was to reduce operating costs by having centralized well control. But safety features, the reduction of hazards, and pollution greatly dictated the design of the layout and the choice of equipment. The two major problems facing the designers were:

1) Proper sizing of all facilities to meet immediate and forseeable needs with flexibility for future development.

2) The placing of the required equipment and piping in a limited platform area.

INDIVIDUAL PIPE LINES — 3 in. ID — feed oil from wells to the central separator. There, in several stages under varying pressures, oil and gas are separated and co-mingled for transmission in the platform-to-shore 12 in. undersea pipe line

Size System for Expansion

The problems to be solved on the equipment platform seemed rugged at first. It was known that two streams of gas would have to be handled; one at 750 psi, the other at 350 psi. Also, oil had to be pumped. The main sizing problem for equipment seemed to be the anticipated production rates. It was finally decided to begin an operation planned to carry through 1957 and have the equipment sized on the expected rates for that year.

All the machinery is housed in a building covered with cement-asbestos. The generator unit is separated from the gas compressor by a fire wall and from the pumps by a pipe alley. This allows for easy addition of any unit if needed.

Gas and oil leaving the 48 mile separator platform juncture with other production at an intermediate platform, where eventually a similar central facility will be installed. From the intermediate platform, gas and oil move to the Burns terminal, where oil and gas is again separated, the oil passing to storage for transportation by pipe line or barge. The gas is dehydrated and compressed to liquefied petroleum for distribution by the United Gas Pipe Line System.

Piping design called for the 12¾ in. line to carry both oil and gas. When the system becomes overloaded, the line will be converted to oil flow only. Gas will be routed through a separate line. Ultimate capacity as an oil line would be 60,000 bbl per day, with 1000 psig at the central separator platform. Under two-phase flow at 1000 psig, it handles 12,000 bbl of oil and 10.5 million cu ft of gas per day.

Minimum oil storage facilities are installed now at the Burns terminal, but additional facilities will be constructed when the line is converted to oil transportation, or as needed.

How Pipe Line Was Installed

By triangulation, the route was marked with piles at 2 mile intervals through the bay area and with buoys at 1 mile intervals along the remainder of the line. A profile of the bottom was drawn from soundings made with a portable fathometer. Cores were taken at regular intervals along the route. The soil types were classified and plotted on the profile. This data showed that the soil would support the pipe uniformly and indicated the type of ditching equipment necessary.

The pipe, double random length line, was hydrostatically tested at the

mill at a pressure of 2100 psig, with three joints tested to an average ultimate strength of 3350 psig. It was cleaned and primed, and a coal tar enamel was applied. Then it was covered with glass fiber and pipe line felt insulation. Finally, concrete of a uniform thickness of 1½ in. with reinforcing wire mesh was applied, giving the pipe a specific gravity of 1.4. The concrete coating was then cured and the pipe stockpiled. Pipe was barged to the site as required.

Concrete coating of the line served a dual purpose. It provided the required additional weight and provided additional protection of the pipe.

The line is provided with pig traps as in any oil line, with the entering trap at the equipment platform and the outlet trap at the terminal. The same size line to shore was decided upon so that one size scraper could be used.

The line was built with two spreads: one shallow water spread working in the bay area, and one deep water spread working in the open water.

Because of the presence of stiff clay and numerous shell reefs throughout the bay, the ditch was dug with draglines mounted on barges, prior to the laying of the pipe. On that portion of the line outside the bay, only mud and sand with a small amount of clay was encountered. Here the pipe was laid first and then ditched down with a jet suction dredge.

Both pipe laying barges, although different in size, contained the same number of work stations: two welding stations, one x-ray and primer station, one drop-and-wrap station, and one joint concreting station. Work was continuous along the pipe line: the pipe was welded, x-rayed, primed, doped and wrapped, the joints concreted, and the pipe lowered into the water.

The line was buried along its entire length because of a marine borer in the central separator platform area. Although able to bore into concrete, the organism does not live below the silt line. Cover on the line also affords some protection against dynamiting by exploration crews.

A diver inspected the pipe, for possible damage to the coating, in the ditch and took soundings to determine if the pipe was at the required depth.

In order to comply with construction permits from the U. S. Army Corps of Engineers, it was necessary to remove the spoil bank deposited by the draglines during the ditching. Disposal of this spoil was by backfilling. No spoil was built up by the jet suction dredge and no backfilling attempted outside the bay area.

The controlling factor in the construction of a pipe line in the Gulf is the weather. Waves more than 4 ft high produced so much movement of the pipe on the barge that it was impossible to make a weld in some bad weather. This, coupled with a long range forecast of bad weather, forced the contractor to halt construction for a few months when 33 of the 48 miles of line had been completed. Work resumed in good weather.

The piping contractors were Dresser Engineering Co. and A. R. Salley Co. ⧺

Air Condition Airport Terminal, Service Areas

. . . at New York International

THE WORLD'S LARGEST installation of absorption refrigerating machines will be employed in New York International airport's central air conditioning system. The system will be one of the first to use the energy from hot water to produce cooling, according to the Carrier Corp.

Five of the machines with a total cooling capacity equivalent to the melting of 3500 tons of ice daily and costing $401,370 will be employed. Pan American World Airways ordered a sixth absorption machine of the same size to be used in air conditioning their new maintenance area at Idlewild.

The order is part of a $60 million program to construct an International Arrival Building and two adjacent Airline Wing Buildings, and individual terminal buildings capable of accommodating 140 aircraft at one time within a 655 acre area.

The automatic absorption unit has no major moving parts and uses plain water as a refrigerant.

The machines will provide chilled water for the air conditioning of the major structures in the new airport development. The chilled water service will be distributed through underground pipes from a central powerhouse as in the case of other utilities.

Pipelines will extend nearly half a mile to supply some structures. The main trunk line from the central station will be two feet in diameter.

The high temperature, high pressure hot water used to power the cooling machines will be same as that used for winter heating. Employing it for air conditioning also equalizes the year 'round load on boilers, Mr. Fenn, Carrier executive, said.

The biggest building to be air conditioned using the new chilled water supply is the three-story, 11 block long, International Arrival Building with its two adjacent Airline Wing Buildings.

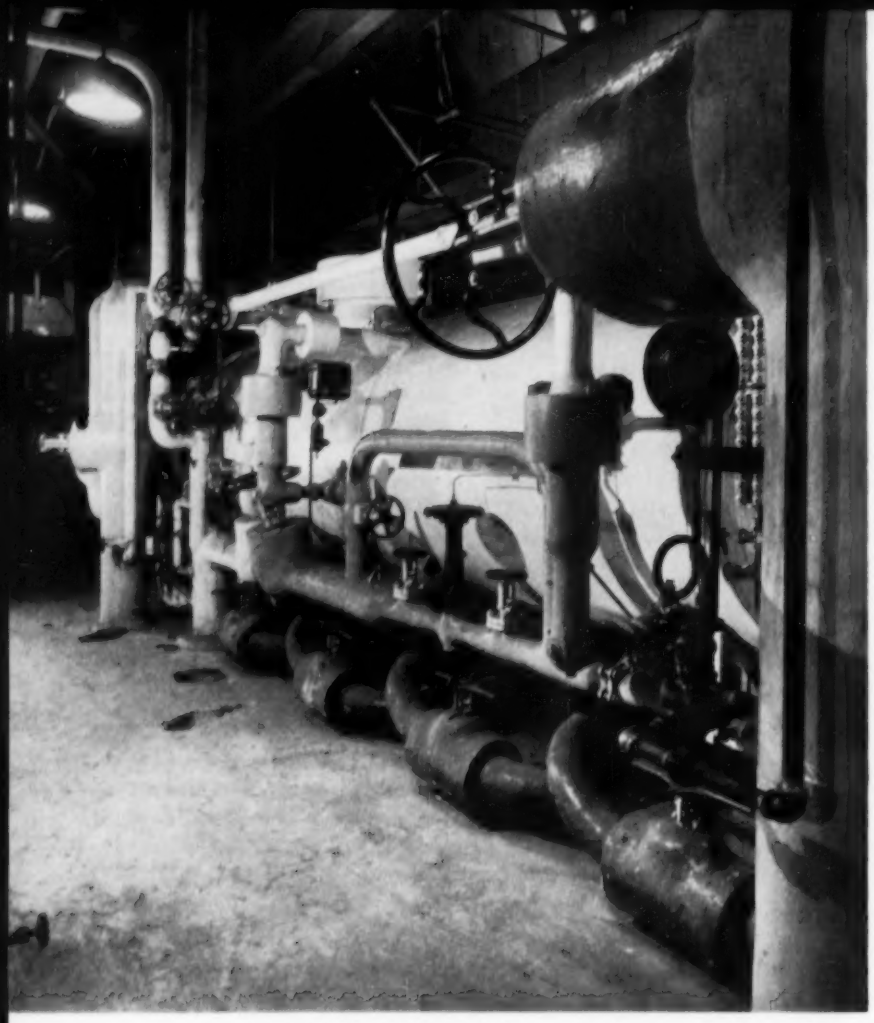
Each of the large refrigerating units may be operated independently, even though tied into a complete system. Featuring electronic "push button" control, they can be individually stopped and started.

The machines operate on the principle that evaporation of water produces cooling, with water vapor created being absorbed by a salt solution.

The salt solution must be continually strenghtened as it is diluted by absorption of vapor. This is done by pumping the weakened solution to a generator where steam, hot water, or other hot solutions are used to boil off excess water. The solution is then returned to the cooling section.

The firm of Seelye, Stevenson, Value, and Knecht was the consulting engineer. ⧺

Evaporators Cut Heating



25,000 LB PER HR EVAPORATOR — one of two — is adequate for full heating load requirements. But the two are operated in tandem on automatic control for the winter load

At Commonwealth Edison Co.'s Ridgeland station, Chicago, one central steam system heats the entire plant, including boiler room, turbine room, electrical centers, miscellaneous buildings, coal handling plant, shops, and office areas. This system provides the required heat in the areas that are not affected by boilers or equipment that transmit heat to the immediate vicinity. Conventional methods of heat transmission — such as radiators, unit heaters, fin type convectors, space heaters, and heating coils with fans — are used throughout.

Steam is also used for domestic water heating and for dehumidifying the coal tunnels by the use of radiation in the summer months.

In place of conventional fuel fired boilers, evaporators using extraction steam from the main turbines generate the necessary steam for heating. From two of the plant's four 150,000 kw tandem, cross compound turbines, extraction steam is passed through the tubes in the evaporator. Heat from the steam is transmitted to the surrounding water in the evaporator shell to generate steam for heating.

Made Possible by Design Change

The direct use of the high pressure boiler steam for heating by means of a pressure reducing and desuperheating station was not practical because of the extremely high temperature and pressure (1050 F, 1800 psig).

Use of reduced pressure extraction steam directly into the heating system mains was not considered feasible since the steam return — unless wasted — might contaminate the main turbine steam cycle and damage the equipment. On the other hand, if this steam were wasted, the cost of makeup would be higher and overall unit efficiency lower.

Use of an evaporator for generating the heating steam at once appeared advantageous. First, design changes involving the installation of a chemical water treating plant had eliminated the need for two installed 25,000 lb per hr evaporators, even as spares, for condensate makeup water for the main turbine system. Only a little more floor space was required for the condensate receiving tank and heating condensate pumps.

Using Turbine Steam Costs at Power Plant

Evaporators using extraction steam from the main turbines generate the steam necessary for all heating at Commonwealth Edison's Ridgeland station. This unusual method, described in detail, was selected chiefly for economy. Ten other advantages invite careful consideration of "evaporator heating" for many installations.

Minor electrical service was required, mainly for condensate pumps. And but little piping was necessary, since the evaporators were conveniently located to receive extraction steam, and to transmit steam to the heating steam main.

One Evaporator Handles Load

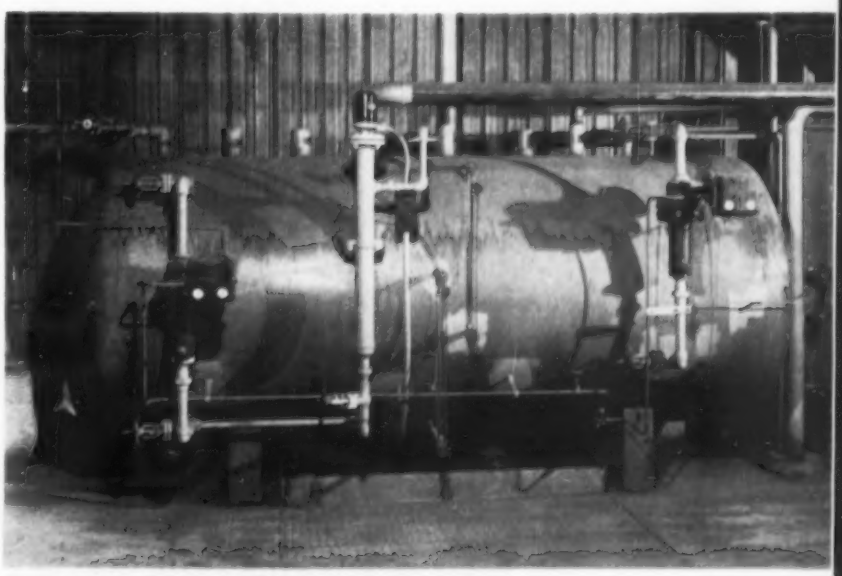
For the heating system load, only one evaporator is required. The second could be used as a standby, but for greater efficiency is operated in tandem on automatic control for normal winter operation.

Evaporator protection against troubles, similar to that for any evaporator, includes: shell vents, reliefs to the atmosphere (outside the roof), level gages, alarms, blowdown piping, and a service water connection for cracking scale. Scaling is minimized and controlled by using a small continuous blowdown ½ in. bypass valve. For added protection there is a relief valve to the atmosphere on the main steam heating system header.

Pump Condensate to Evaporator

A 1500 gal condensate return storage tank collects condensate from the entire building heating system. Makeup water for this tank is provided two ways. Normal makeup is treated water used for the main boiler plant condensate makeup supply. Emergency makeup is obtained through a tie line from a city water storage tank. The condensate storage tank water level is automatically maintained from these makeup lines. On this tank there are the normal vents, drains, alarms, and overflow piping.

Water for the heating system is furnished from the condensate return storage tank. A manually operated 80 gpm centrifugal conden-



1500 GAL CONDENSATE RETURN TANK collects and stores condensate from the entire building heating system. Normal makeup is treated water used for main boiler plant condensate makeup supply. In emergency, makeup is obtained through tie line from a city water storage tank

sate pump running continuously pumps the required amount of feedwater to the evaporator. An orificed recirculating line to the suction side of the pump prevents operation at closed discharge. A spare pump also can be started manually in case the first pump fails.

Water pumped to the evaporator by the condensate pumps is evaporated into steam, which is piped to the heating steam header.

Evaporator coil drainage is returned to a feedwater heater of the main turbine plant, as is normal. Drainage control maintains a constant level in the drainer at all times.

Two Units Improve Efficiency

Heating system steam requirements, as previously explained, are fulfilled by the evaporator vapor, which maintains a constant pressure in the heating steam headers. So, as the load fluctuates, the heating steam header pressure varies, signalling the vapor regulating valve to maintain the correct pressure. Using one evaporator is normal summer operation and emergency winter operation.

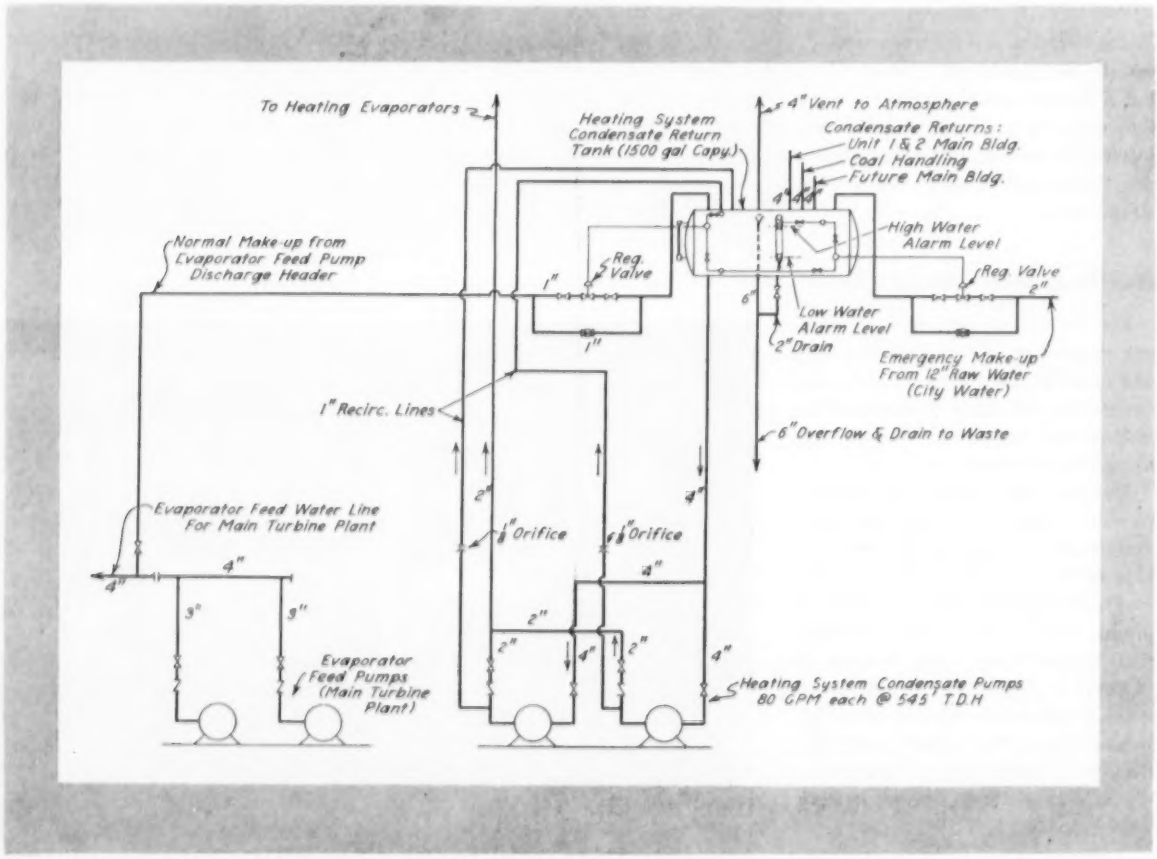
In winter, efficiency is improved by an additional control system. Since both evaporators are in service normally, equal steam loads would be required from both main turbines. As only one evaporator is necessary for full load requirements, each would be between no-load and one-half load.

With the additional control, the lead evaporator operates the same as before, from pressure demand of the heating steam header. However, the second evaporator obtains its loading from steam flow requirements. Steam flow orifices are in the vapor discharge lines of both evaporators. Other controls maintain the load of this second evaporator equal to the first on the basis of equal flow, providing additional flexibility and improved control in the course of varying load demands.

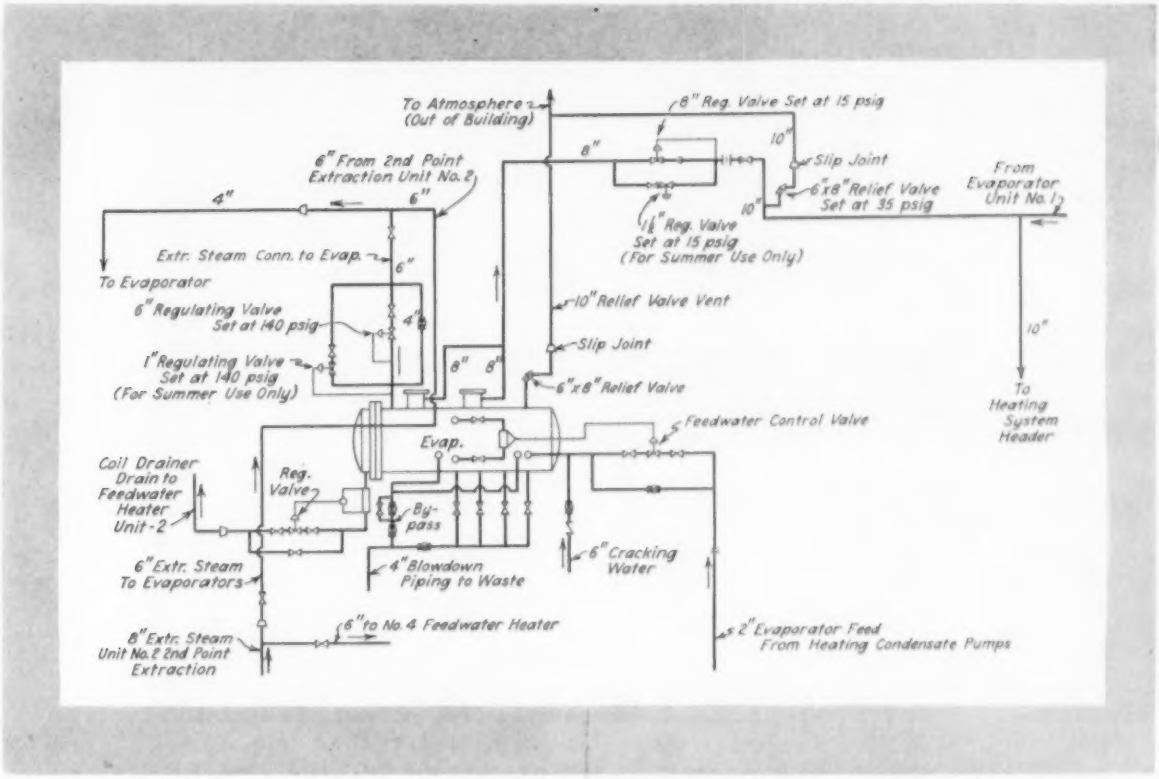
The amount of feedwater in the evaporator is maintained constant — regardless of steaming requirements — by a regulating valve on the water supply line from the condensate pumps.

Evaporator Makes 15 Psig Steam

The amount of heating steam required is controlled by a pressure regulating valve, which maintains constant pressure of about 15 psig in the heating system header. Opening and closing, it increases or de-


To Heating Evaporators
Heating System Condensate Return Tank (1500 gal Capy.)
4" Vent to Atmosphere
Condensate Returns:
Unit 1 & 2 Main Bldg.
Coal Handling
Future Main Bldg.
High Water Alarm Level
Reg. Valve
Reg. Valve
Normal Make-up from Evaporator Feed Pump Discharge Header
Low Water Alarm Level
2" Drain
Emergency Make-up From 12" Raw Water (City Water)
1" Recirc. Lines
6" Overflow & Drain to Waste
Evaporator Feed Water Line For Main Turbine Plant
Orifice
Orifice
Evaporator Feed Pumps (Main Turbine Plant)
Heating System Condensate Pumps 80 G.P.M. each @ 545' T.D.H

PIPING FOR EVAPORATOR SYSTEM includes typical evaporator safety features. Extraction steam from turbine evaporates water pumped from condensate tank into steam, which is piped to the heating steam header. Evaporator coil drainage is returned to a feedwater heater of the main turbine plant


To Atmosphere (Out of Building)
8" Reg. Valve Set at 15 psig
10"
8"
Slip Joint
6"x8" Relief Valve Set at 35 psig
From Evaporator Unit No. 1
1½" Reg. Valve Set at 15 psig (For Summer Use Only)
6" From 2nd Point Extraction Unit No. 2
4"
6"
Extr. Steam Conn. to Evap.
6"
To Evaporator
6" Regulating Valve Set at 140 psig
4"
10" Relief Valve Vent
Slip Joint
1" Regulating Valve Set at 140 psig (For Summer Use Only)
8"
8"
6"x8" Relief Valve
10"
To Heating System Header
Feedwater Control Valve
Evap.
Coil Drainer Drain to Feedwater Heater Unit-2
Reg. Valve
By-pass
6" Cracking Water
6" Extr. Steam To Evaporators
4" Blowdown Piping to Waste
8" Extr. Steam Unit No. 2 2nd Point Extraction
6" to No. 4 Feedwater Heater
2" Evaporator Feed From Heating Condensate Pumps

HEATING SYSTEM FEEDWATER, furnished from the condensate return storage tank, is continuously pumped in required amount by an 80 gpm centrifugal pump to the evaporator

creases flow to the header as demanded.

Because of flexible requirements of the system, a small and large control valve are necessary. The small valve is for summer operation for plant hot water and dehumidification of coal tunnels; the large valve is needed for winter heating.

Each Turbine Feeds Evaporator

Steam to the evaporator for evaporation is extracted from the low pressure turbine of two 150,000 kw turbogenerator units. Each turbine feeds one evaporator. This provides flexibility in case of an outage of either machine. Also, when both evaporators are used in tandem—normal winter service—the steam demands are equalized from each turbogenerator unit. In an extreme emergency, a spool piece can be switched to permit an extraction steam cross tie between units.

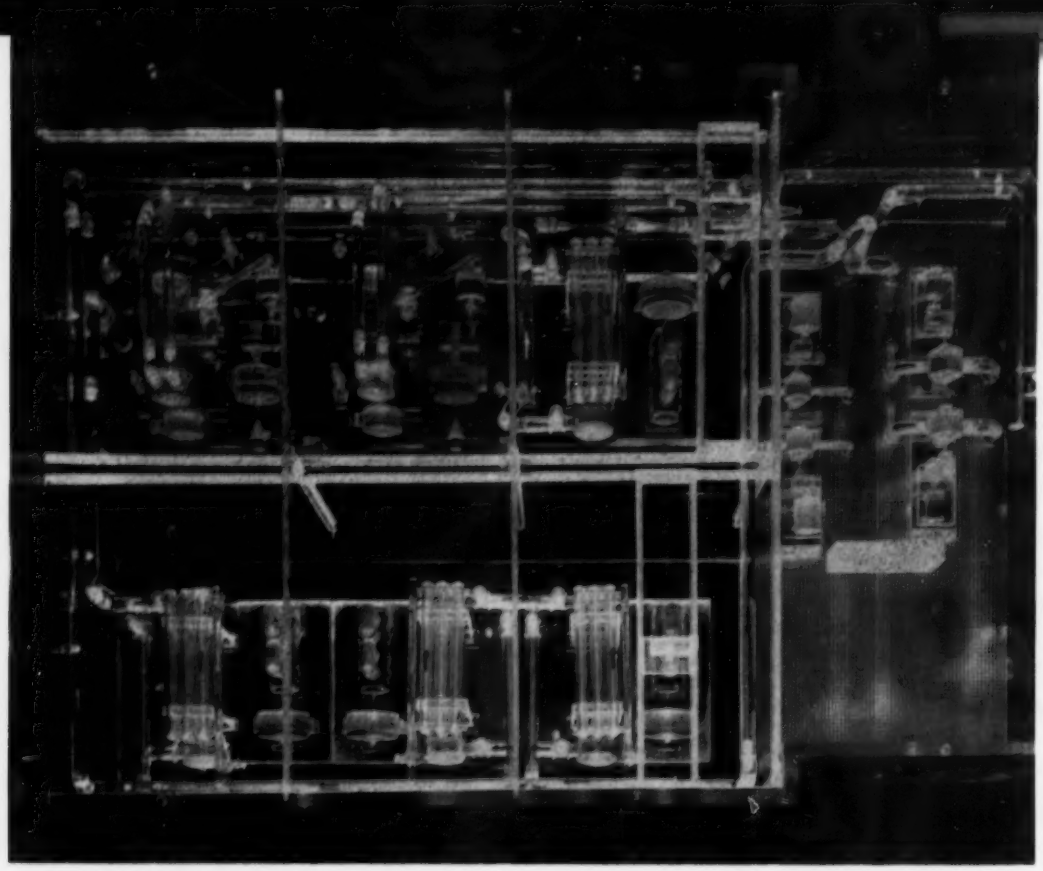
Steam entering the evaporator is valve controlled to maintain a constant coil pressure, depending on the demand. Demand varies according to the amount of steam required to evaporate the vapor to maintain constant pressure in the heating system header. Again, because of flexible requirements, there is a small and large control valve for summer and winter, respectively.

This control system is adapted to either single or tandem evaporator operation by manually changing a three-way valve on the control air line. Changeover from the small summer to large winter control valves automatically occurs to the evaporators in service as a result of downstream header pressure fluctuation.

Use in Other Installations

Evaporator heating in a modern power plant has many advantages. Among them:

- Isolation of the pure condensate of the main system from the condensate of the heating system, which is impure yet adequately clean for heating. This is important in modern plants where extremely pure condensate is a necessity.
- Safe equipment, since only a heat exchanger is involved; no fire, fuel, or complicated controls.
- Minimum operating costs, since no operator is required except for routine check; the job can be combined with an area attendant's work.
- Low cost steam from efficient high pressure boilers first performs work in a turbine before being extracted for heating.
- Low maintenance costs, since minimum, simple equipment is involved.
- Generally trouble-free system, since controls are simple yet automatic.
- No additional stack dust, refuse, or plant dirt problem; thus a clean installation.
- No extra fuel handling equipment and no storage areas.
- Economical initial installation, because of minimum floor space, etc.
- Great economy when a small quantity of steam is needed year 'round, as for domestic hot water, etc. ⊣



PLASTIC MODEL shows the first two new centrifugal compressors in place at the upper left. The remaining four old reciprocating compressors will be replaced by two more centrifugals after the 1956 cooling season

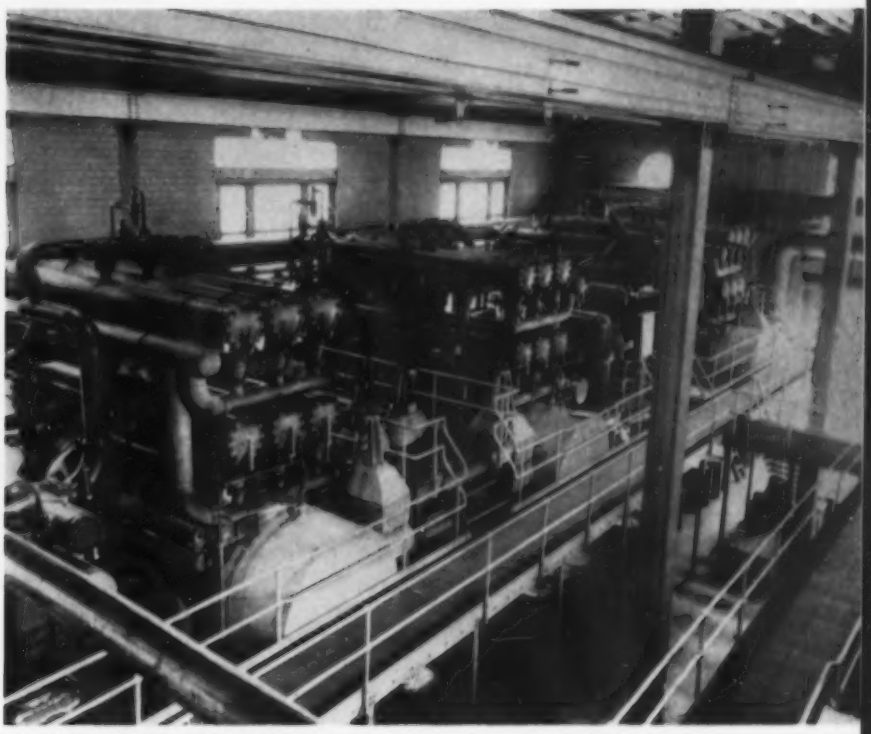
Plastic Model Is Tool in Planning Capitol Hill Cooling System

A single remote cooling plant with four centrifugal compressors totaling 8800 tons serves seven large government buildings on Capitol Hill via a two mile loop chilled water pipe line. The loop holds about 600,000 gal of water and ultimately will circulate 26,400 gpm at 40 F.

COMPLETED this summer is the first step in a two-stage program to double the size of the Capitol Power Plant refrigeration apparatus. The equipment serves the air conditioning system for the U.S. Capitol, the old and new House Office Buildings, the Senate Office Building, the additional Senate Office Building now under construction, the Supreme Court, and the Annex to the Library of Congress. The entire enlarged circulating system will be finished for operation in 1957.

A composite scale model of plastic was made of the entire refrigeration apparatus room (120 ft × 75 ft × 35 ft) and its installations to demonstrate the interior space conditions prevailing during construction. A scale of not only the new machines but of the old machines as well was required so that the scale model could be actually altered during con-

By John Chandler
Engineer
York Corp.



SIX OLD COMPRESSORS installed in 1937 are being replaced by four new machines. The old plant produced 4800 tons of refrigeration, while the new one produces 8800 tons

struction to show exactly the condition that existed in the Power Plant.

The model was built on a scale of ¼ in. = 1 ft. No major improvements in design of the system resulted from the use of the model, but it was useful in checking major shop drawings for clearances. This was especially true when equipment with dimensional differences from that specified was involved.

During the entire construction and installation of this job, it was necessary for the air conditioning system to be kept in operation. The final performance test on the entire plant will be made during the 1957 air conditioning season.

New Compressors Replace Old

Two new 2500 hp centrifugal compressors went into action alongside four of the six old reciprocating compressors which have been cooling the Capitol and House and Senate Office Buildings since 1938. Two of the old compressors were removed to make way for the new centrifugals, and the remaining four will be replaced by two additional centrifugals following this air conditioning season. By late spring of 1957, the job will be completed, and four 2200 ton compressors will have taken over from six 800 ton compressors.

The new installation—8800 tons of refrigeration — take only two-thirds of the space occupied by the original 4800 tons. Although twice the capacity, the new equipment is costing the Government approximately the same amount as the original 4800 tons bought in 1935.

The Capitol Power Plant furnishes steam and chilled water to buildings on Capitol Hill via a two mile underground tunnel connecting the buildings to the Power Plant. During the air conditioning season 17,600 gpm of 40 F water will be pumped during peak load periods.

In each of the buildings are installed air washers with cooling coils in which the chilled water circulates in a closed system.

Original System Installed 1937

The original system, conceived in 1935, was installed in 1937. An article, *World's Largest Plant Cools Congress*, by M. S. Lebair in the July 1938 HPAC discussed the engineering features of the original system. Equipment was large and bulky, consisting of large reciprocating type compressors—22 × 18 in., four cylinder—with nests of condensers instead of a single condenser.

Although 20 years old, this system was still in operating condition and doing the job it was designed to do.

The Architect of the Capitol, acting under the direction of the House Office Building Commission, engaged consulting engineers to design the original air conditioning systems. During the installation tremendous problems were encountered, particu-

larly with the arrangement of the air handling equipment. The main problem was the lack of detail structural plans of the older sections of the Capitol Building and the House Office Building. A tremendous amount of cutting in the walls, floors, relocating existing equipment, replastering, and painting was necessary, which took considerable time.

It was necessary to enlarge and replace an existing 36 in. cast iron pipe line which circulated river water to the Capitol Power Plant from the Pump House in the Anacostia river. This pump house, which had been installed for condenser water for the steam plant, was modernized and enlarged to supply additional condenser water requirements of the refrigeration plant.

The original Capitol Power Plant job, awarded in 1937, was completed in 1938. The job has been running satisfactorily ever since, with minor changes and a minimum of maintenance.

New Building, Other Loads Up

Reasons for the new installation are that the new Senate Office Building adds approximately 2000 tons to the load—plus increasing loads in the buildings already air conditioned —and that the water cooling loads of some of the original buildings having their own plants will be thrown on the Power Plant.

Considerable time was spent in finalizing the most economical method to increase the capacity of the Power Plant. At one time it was considered to add additional machines to the present machines, but because the Capitol Power Plant is no longer generating 25 cycle current necessary to operate the existing equipment, it became costly to replace the existing 1000 hp motors with 60 cycle motors plus enlarging the building. It was obvious that in the long run it would be cheaper for the Government to replace the entire refrigeration system with new centrifugal machines.

In designing the refrigeration plant the consulting engineer utilized the existing foundation system below the top of the refrigeration apparatus room floor slab without any alterations. This was extremely important because the existing reinforced slab rests on concrete piles, each with a safe carrying capacity of 75,000 lb.

Equipment of Standard Design

The compressors are standard and are designed not to overload the 2500 hp motors more than 3 percent.

The refrigeration condensers also are of standard design, two-pass, but of larger size than has ever been built for air conditioning application. The water side of each condenser is designed for 150 psig working pressure and is supplied with water boxes so that the boxes may be removed without disturbing the piping connections.

The water chillers are shell and tube type, single-pass, designed for flooded operation and with a minimum pressure drop. Water boxes are specified with a working pressure of 200 psig. Six inspection openings are required on the shell for inspection purposes and replacing eliminators.

Interstage cooling is required of the standard external type. A standard purge and recovery system is required with each individual system and a pumpdown system is furnished under another contract so that the refrigerant charge of any one system may be stored as required for general maintenance.

The pipe, valves, and fittings for the coolant water lines are polished brass. This piping was installed with strap wrenches, and no threads are visible. The water coolant lines are connected to a common header.

Each of the refrigeration systems is provided with three safety devices mounted in the proximity of their respective actuating elements. They are the manual reset type, with red pilot lights provided on the main control panel. Each compressor is driven by a 2500 hp unity power factor 900 rpm synchronous motor, with individual shaft driven direct connected excitor. The current is 4160 volt, three-phase, 60 cycle as supplied by the Potomac Electric Power Co. The motors are rated in accordance with the National Electrical Manufacturers Association Standards for 4000 volts design. The motors are designed for full voltage across-the-line starting, with a locked rotor kva not over 15,000, with the external field discharge resistor connected in the field circuit. Each motor has a temperature monitoring system consisting of one direct reading temperature indicator, which monitors the temperature at any of the detectors by either a selector switch or plug-in jacks.

Control Panels Are Unique

A main control board for the entire plant is remote from the machines. In addition, there is a local control station for each machine. Each control station includes a control system for exciting the direct current field of the 2500 hp motor; a start-stop pushbutton station for the motor; two start-stop pushbutton stations; and two motor starters for the auxiliary compressor and speed increaser lubricating pumps. Short circuit protective devices are furnished for the two auxiliary motor pumps and oil heater circuits.

Also mounted on this panel are the refrigeration pressure gages, all pilot lights, positioning controllers, and selector switches for the automatic control of the systems. In addition, at a remote location is a duplicate set of positioning controllers and selector switches.

The speed increasing gears are capable of transmitting 3000 hp from the synchronous motor operating at 900 rpm to the centrifugal refrigeration compressor operating at 4810 rpm.

Each of the four centrifugal water cooling systems is supported on fabricated steel frames completely isolated from the building with spring type vibration isolators. The vibration isolators were selected so that the natural frequency for the coupled spring action of piles and isolators is below the disturbing frequency of the centrifugal machine. The entire fabricated steel frame was filled with poured concrete when completed.

CAPITOL HILL'S NEW COOLING SYSTEM serves U.S. Capitol, center, old and new House Office Buildings, left, Library of Congress and annex, left foreground, Supreme Court, right foreground, and Senate Office Building, right. All will be cooled from remote plant, off picture to left

The water cooling systems underwent very complete and rigid tests at the factory as well as in the field. The performance tests were made in stages because of the construction schedule, a final performance test to be made after the job is 100 percent complete.

Modernize System in 5 Stages

This is all part of a large modernization program for Capitol Hill, and is being handled in five phases:

1) Construction of the new and enlarged tunnel, started in 1952, and already completed.

2) Installation of three new 110,000 lb steam generating units, started in 1951, and completed.

3) Conversion from 25 cycle current to 60 cycle current, as supplied by the Potomac Electric Power Co., partly done. This meant not only changing the equipment in the Capitol Power Plant but also the equipment on the entire Capitol Hill. Each building was gradually changed over in the program.

4) Purchase and installation of the centrifugal water cooling system to replace the original system.

5) Installation of a large cooling tower, water pumps, electrical gear, and the necessary piping revisions within the Capitol Power Plant.

Cooling Tower Solves Problems

The old Capitol Power Plant system received its condenser water from a pumping station in the Anacostia river, ¾ mile from the plant. Since, because of its age and limited size, it would have to be replaced to handle the increased capacity, a new cooling tower installed on the present Capitol Power Plant property was deemed more economical. Now the Capitol Power Plant can chemically treat its water and have definite control of the scale build-up in the condensers. In the past, the principle water problem has been impurities in the condenser water which caused considerable scale build-up. Another factor is that the Anacostia river temperature is continually rising. Entering condenser water temperatures as high as 91 F greatly reduced the capacity one season.

In the original system of six 800 ton reciprocating machines, the chilled water entered system No. 1 at 54.4 F and proceeded in series through the entire six units, leaving the sixth unit at 40 F. This was an extremely flexible system and balanced itself to fluctuations in load. As the load built up, the operator merely had to add another machine on the line. The condenser water entered each system in parallel.

Units in Two Parallel Systems

In the new system of four 2200 ton turbo compressors, because of the increased water quantity, the pressure drop, and water line sizes, it was impossible to hook up the four chillers in series. Therefore, there are two systems in parallel, each containing two water cooling units in series. All condensers are in parallel as they were before. The new system uses the same fluorinated hyrocarbon refrigerant No. 12 as did the original system. Three 700 hp chilled water pumps and four 300 hp condenser water pumps—all electrically driven—replaced the existing turbine driven pumps.

The consulting engineer was Guy B. Panero. The new installation was made under the direction and supervision of the Architect of the Capitol. ≠

Piping Flexibility Invades "Ivy Walls"

. . . to meet the shortage of piping engineers by intensifying practical education and experience

By R. H. Reece

Instructor of Mechanical Engineering
California State Polytechnic College

PIPING ENGINEERING has deepened its penetration of the "ivy walls" of American engineering education in recent years. This is in accordance with the increasing importance of the role piping is playing in modern technology, in industrial processes as well as in heating and air conditioning. It is also in recognition of the shortage of experienced piping engineers which has existed throughout the U. S. for several years. And, further, it is a determined effort to provide practically trained managerial and technical men for industry's future needs, which promise to be even greater than today's.

Typical of the increased emphasis being given to the subject is the course in piping flexibility at California State Polytechnic college, at San Luis Obispo, Calif., one of several such specific courses in piping design. Comparatively new in the field, this school has since 1940 been providing occupational education at the collegiate level in engineering. Training is specific and practical. Each year of study is planned to prepare the student for additional jobs in the training area of his major department. Requirements of the job, rather than of professional graduate schools, determine the educational experiences offered to each student. Practical laboratory work under job conditions is emphasized. Students learn by doing. They may also earn while learning through the project system of instruction in which the college has been a pioneer.

Train Students to Recognize Essential Factors

To be able to lay out a plant on a clean piece of paper and then supervise the making of detailed construction drawings requires engineering and organizational ability in a high degree. Because expansion and contraction of pipe lines due to temperature changes cause more headaches to the mechanical design engineer than any other problem of piping design, students are trained to recognize the essential factors which influence the strength of piping. With process industries more frequently employing extremes of temperature and pressure—above and below atmospheric—the piping engineer must thoroughly understand the stresses in a piping system and the forces acting on the attached rotating equipment.

A good piping engineer must be familiar with materials and methods of construction; thermal expansion and methods for its compensation; corrosive liquids and materials for handling; general layout and details of high pressure, high temperature piping systems. Pressures up to 2500 psig and temperatures up to 1200 F are common today. Nearly all gasoline refineries, chemical plants, and steam plants—not to mention industrial atomic projects—have piping problems involving the above conditions.

The present college courses touching on the subject of piping flexibility are undoubtedly forerunners of much more detailed treatments of its many facets. But there is little question that piping flexibility analysis no longer can remain the province of consultants and highly specialized staffs of major engineering companies, as it has tended to do in the past. Piping designers in every branch of industry must become familiar with the problem, at least to the extent that they can apply the simpler approximate.

Course Covers Several Types of Applications

Among the types of applications covered in detail by the course are:

- Heat exchangers, including points of anchorage, dimensions from nozzle to anchor points, temperatures, materials, and allowable reactions.
- Pumps, including location of supports, dimensions of nozzles, and allowable reactions.
- Towers, vessels, and so forth, including sketches to show height, diameter, and thickness of tower, location of connecting nozzles dimensioned from center line, length of skirt with thickness and insulation included, temperatures of various sections.
- Turbines, including turbine leads, extraneous movements of turbine nozzles or free expansion at stop valves, and allowable reactions.

Here's Example of Instruction Procedure

For an idea of the scope and actual procedure of instruction, take the following example. First, the student is given a set of plans of the piping in some area of, say,

a refinery. From these plans he is given a line number. The student then has to make an isometric, showing all dimensions of this line. Then after marking the drawing "Shop Fabricate" or "Field Fabricate" and listing the material as "Shop Fabricated Material," "Field Fabricated Material," or "Assembly Material," he works out the pipe line flexibility.

For high pressure, high temperature pipe lines, thermal expansion is provided for by taking advantage of the inherent flexibility and the elastic properties of the pipe line itself, as is general practice. Thus in planning the piping layout, advantage is taken of directional changes which will in themselves provide the necessary flexibility.

Information required for piping flexibility analysis by the student includes:

1) Piping drawing or sketch, including:

a) All dimensions.

b) All branches connected to pipe being considered.

c) Points where deflections are required if these are known.

2) Piping specifications:

a) Pipe size, outside diameter, and wall thickness. State whether average or minimum wall.

b) Pipe material.

3) Operating conditions:

a) Maximum operating temperatures.

b) Maximum operating pressures.

The analysis involves the following steps:

1) Determine the horizontal and vertical expansions which would take place if the structure were free to move.

2) Determine the position of the elastic center from the known dimensions of the structure.

3) Determine the horizontal reaction F_H and the vertical reaction F_V by the use of the formula. The slope of the thrust line depends on the ratio F_V/F_H.

4) Determine the moments at all critical points. Evidently the points where the thrust line crosses the structure are the points of zero moment. For best stress conditions, valves, joints, and such should be as close to these points as possible.

How Pipe Stress Problems Are Handled

In general, provisions for the expansion of lines 300 F or less — or at the higher temperatures for sizes 3 in. and smaller — do not require design calculations. However, it is the responsibility of the instructor to determine which lines are given to the student for detailed expansion and stress calculations. In selecting these lines, special consideration is given to hot lines connecting to pumps or equipment.

The instructor gives layouts and sketches to the student, or marks in yellow on a layout print, the lines to be analyzed by the student.

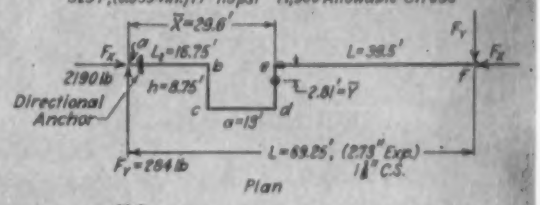
When layouts do not show a complete picture, a freehand correct isometric sketch accompanies the layout, showing the complete dimensional picture.

• here's a typical example and solution based on square corners

LINE 21A - 8"

8" Sch 40 A-53 Gr. A

525 F, (0.0394 in./ft) 115 psi 12,900 Allowable Stress



Plan

$F_X = 357(603)\frac{72.5}{(69.25)^2} = 3250$ lb approx.

$F_Y = 19(603)\frac{72.5}{4800} = 180$ lb approx.

$S_a = 190(603)\frac{8.63}{69.25} = 14{,}300$ psi approx.

$\therefore f_c\ (\text{max at } c) = \frac{6.5' \times 3255 \times 12}{7.29}\frac{C.S}{(0.667)} = 23{,}200$ psi approx.

Stress intensification factor, $i = \beta = 2.4$

ELASTIC CENTER, ORIGIN AT "a"

Line	LK	Y	LKY	X	LKX
ab	16.75	0	0	+ 8.38	140
b	8.4	0	0	+16.75	140
bc	8.75	−4.38	38.3	+16.75	147
c	8.4	−8.75	73.5	+16.75	140
cd	13.0	−8.75	113.8	+23.25	310
d	8.4	−8.75	73.5	+29.75	250
de	8.75	−4.38	38.3	+29.75	260
e	8.4	0	0	+29.75	250
ef	39.6	0	0	+49.50	1950
	120.35		−337.4		3547

$\therefore \bar{Y} = \frac{-337.4}{120.35} = -2.81'$ (2.24') $\therefore \bar{X} = \frac{3547}{120.35} = 29.6'$ (31.5')

MOMENT OF INERTIA AND PRODUCTS OF INERTIA ABOUT ELASTIC CENTER

Line	LK	Y	I_x	X	I_Y	I_{XY}
ab	16.75	+2.81	132.0	−21.22	7525	− 995
b	8.4	+2.81	66.3	−12.85	1388	− 303
bc	8.75	−1.57	22.6+55.8	−12.85	1445	+ 175
c	8.4	−5.94	296.0	−12.85	1388	+ 765
cd	13.0	−5.94	458.0	−6.35	525	+ 490
d	8.4	−5.94	296.0	+0.15	—	—
de	8.75	−1.57	22.6+55.8	+0.15	—	—
e	8.4	+2.81	66.3	+0.15	—	—
ef	39.6	+2.81	312.0	+18.90	14080	+2950
			1783.4		26351	+3082

$\frac{I_{XY}}{I_Y} = \frac{3082}{26351} = 0.117$

$\frac{(I_{XY})^2}{I_Y} = 0.117 \times 3082 = 360$

$V = 0 \quad H = 69.25$

$\therefore F_H = \frac{90200 \times 72.5(69.25 + 0.117)}{(1783 - 360)144} = 2210$ lb approx.

$\frac{I_{XY}}{I_X} = \frac{3082}{1783} = 1.73$

$\frac{(I_{XY})^2}{I_X} = 1.73 \times 3082 = 5330$

$V = 0 \quad H = 69.25$

$\therefore F_V = \frac{90200 \times 72.5(0 + 69.25 \times 1.73)}{(26350 - 5330)144} = 284$ lb approx.

$R = 2210$ lb approx.

$f_{max.}\ (\text{at } c) = \frac{7.5 \times 2210 \times 12}{7.29}(0.667) = 18{,}200$ psi approx.

If vessel expansion is a factor, special attention is given to show a complete dimensional picture of the vessel or vessels to which the line attaches. On the vessel is to be shown the elevation of the point from which the expansion will be calculated.

The student keeps a folder of all pipe stress calculations, together with the data sheets furnished for analysis. At the end of the project this folder becomes a part of the mechanical engineering department files.

After pipe stress calculations have been made, each line is returned to the instructor with the following information, depending on conditions discovered:

- Line can remain as submitted.
- Dimension and location of desired loops.
- Location of anchors, guides, or special supports.
- Location of expansion joints and amount each joint must compensate for both transverse and lateral.

To save time in drafting and calculating, quarter bends are eliminated in layouts, since the Code for Pressure Piping permits the simplifying assumption of square corners neglecting the added flexibility due to the flattening of an elbow, a safe assumption so far as reactions are concerned. The sketches, drawn to scale, contain straight branches only.

However, now mandatory is the application of the stress intensification factor, multiplying the stress in corners by this factor. In the majority of cases the effect of including the flexibility factor for elbows is minimal.

Only in the case of short branches and many elbows — when the system is confined to a relatively congested space and for elbows which have a large modified length — will the inclusion of the flexibility factor be effective in reducing stresses and reactions materially. ≠

ON THE JOB

Cooling Towers Solve Plant's Water Shortage

. . . save 22 million gal monthly

WATER SHORTAGE was a problem for Tecumseh Products Co., Tecumseh, Mich., which was outgrowing the community water supply, according to Acme Industries, Inc.

It became apparent that diverting more water from the city supply would make it impossible to supply homes in the community with water, and would jeopardize the fire protection system. Tecumseh engineers decided that the continuation of full operation depended on either obtaining a more adequate supply of water, or instigating a substantial conservation program of the water being used in industrial processes. An inspection of the underground water strata disclosed that water was not available from the ground, so various methods of water conservation were surveyed.

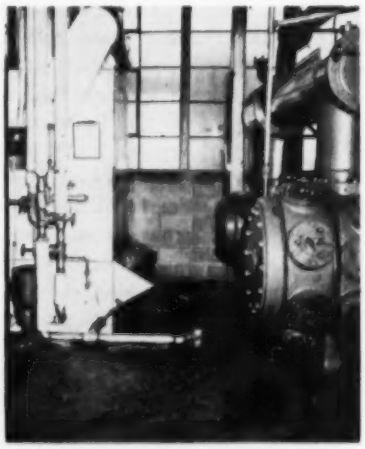
Checking plant operations showed that 22 million gal of water per month flowed directly to the sewer after one use. This water was used only for cooling and was unaffected chemically during operations.

The problem was placed in the hands of A. G. Wilrick, plant engineer. Preliminary engineering surveys indicated the job could be handled by one or two large cooling towers on the roof. At the same time, it was noted that approximately one-third of the water used in the plant consolidated in 10 specific locations, and these could each be served by an individual tower. A cost comparison between the two methods was made, and it was found that the use of individual towers, close to the machines they served, would be most economical.

Approved by the management was the original plan to install a series of recirculating towers involving a total expenditure of approximately $20,000, including $10,000 for seven towers, $2000 labor in the plant, and $6500 for ductwork and materials.

Nine towers were installed: one 70 ton; three 30 ton; one 35 ton; one 20 ton; three 45 ton.

The monthly water cost for each unit is computed on the basis of



NINE INDIVIDUAL TOWERS totaling 350 tons are installed near the machines they serve

3 cents per gal, plus a 50 percent sewer charge, or a total of 4½ cents. The overall average of amortization is 20 months.

The water conservation figures have been borne out by the monthly water billings, which show a drop from 62 million gal per month to 40 million gal per month. ≠

TRADE PROMOTION PANEL was one of several informal discussion sessions. Seated at table, left to right, are chairman Frank V. McBride, Patterson, N. J. and Lloyd B. Gruman, Jr., secretary of the Mechanical Contractors Association of America. Standing is Harold Ryan, New York

HPAC Contractors Convene

. . . to report year's progress, plan for the future

THE GROWING MARKET for air conditioning, piping, and heating services in commercial buildings, industrial plants, and other buildings of all types was the general theme of the 67th annual convention of the Heating, Piping, and Air Conditioning Contractors National Association held recently in Louisville, Ky. Better installation methods and ways for the heating, piping, and air conditioning contractor to get his full share of business were stressed in committee reports, talks, and panel discussions. The importance of apprentice training was also stressed.

Close to 500 attended the convention, which had been arranged by the Louisville local association convention committee under the chairmanship of George E. Blanford. Edward J. Jungbert, of Louisville, who has been serving as president of the association during the past year, presided at the general sessions.

As in recent years, there were a number of informal panel sessions on various subjects.

Wray M. Scott, chairman of the National Certified Pipe Welding Bureau and past president of the association, stated in his report, "As piping contractors in 1956, you have a vital interest in welding. It is now an industry-wide accepted method of joining pipe, often a required method.

"It is just as much a tool of the pipe fitting industry as the wrench or the pipe cutter. And the quality of the weld is the responsibility of the contractor, a responsibility that he can not shift to a foreman or an inspector.

"From this standpoint, the contractor must himself understand enough about welding so that he can be sure that he is getting good work and giving his customers quality welds. He can do this by himself if he is diligent, but he can do this earlier and more economically if he cooperates with his fellow contractors in a local chapter of the National Certified Pipe Welding Bureau."

Joseph S. Kearney, of Chicago, stressed the importance of requesting consulting engineers and architect-engineers to specify that all pipe welding be done by certified welders. In this way, the standards will be raised and the value of certified welders will be enhanced. He reported that the members of the Chicago contractors association have been enclosing copies of the certificates for qualified welders when submitting a bid. This is resulting in requests from some consulting engineers asking for these certificates when they are not enclosed with the bid. The standards for pipe welding are sure to be raised if others follow a similar procedure in stressing the value of certified pipe welders on the job.

Joseph C. Fitts, secretary for the bureau, suggested that some standard specification provisions be adopted

and sent to consulting engineers and architect-engineers on the subject of referring to the appropriate piping code but not necessarily requiring that all the details be specified. The one big advantage of this, of course, would be to relieve the engineers from citing every minute detail in the specification for pipe welding.

Professor Robert S. Green, of Ohio State university, who serves as technical consultant for the pipe welding bureau, reported that a seminar was started for welding instructors which was sponsored by the bureau and operated by Ohio State. The first one was so successful that it has been repeated in 1956. For best results, the enrollment has been limited to one representative of each chapter.

Thirteen Standard Procedure Specifications were adopted during the past year. They are:

1) For metal arc welding of carbon steel pipe, valves, fittings, and flanges.

2) For oxyacetylene welding of carbon steel pipe, valves, fittings, and flanges.

3) For metal arc welding of carbon molybdenum steel pipe, fittings, and flanges.

4) For metal arc welding of chrome-molybdenum alloy steel pipe, fittings, and flanges.

5) For helium shielded tungsten arc welding of aluminum pipe, fittings, and flanges.

6) For metal arc welding of 2¼ percent chromium, 1 percent molybdenum alloy steel pipe, fittings, and flanges.

7) For metal arc welding of austenitic stainless steel pipe, fittings, and flanges.

8) For inert gas shielded tungsten arc welding of thin wall austenitic stainless steel pipe, fittings, and flanges.

9) For argon shielded tungsten arc welding of aluminum pipe, fittings, and flanges.

10) For metal arc downhill welding of carbon steel pipe, valves, fittings, and flanges.

11) For metal arc welding of wrought iron pipe, fittings, and flanges.

12) For oxyacetylene welding of wrought iron pipe, fittings, and flanges.

13) For inert gas shielded tungsten arc and shielded metal arc welding of chrome-molybdenum alloy steel.

Air Conditioning Advances

William S. Bodinus, chairman of the air conditioning committee, said that air conditioning is continuing to grow at a much greater rate than was previously anticipated. He said that the absorption type of refrigeration system has been recently revived.

In some areas where steam or natural gas is available at economically feasible rates, it is being applied increasingly. Jack Salmon, of the Carrier Corp., presented a slide film on the absorption cycle and discussed several applications.

Harold J. Ryan, HPAC contractor in Long Island City, N. Y., stressed the fact that the responsibility of the HPAC contractor is greater now than it ever has been. One of the main reasons for his point about this was that he felt that the HPAC contractor was called upon to exercise his judgment on many phases of any job. Mr. Ryan pointed out that it is the HPAC contractor who is responsible for making the system work. He must be sure that all phases of the design are accurate and that all factors are taken into account.

"The mechanical (heating, piping, and air conditioning) contractor today must be an expert and act as a middleman who must satisfy the owner by applying all of his 'know-how' of these installations," Mr. Ryan said.

Heat Pump Discussed

The heat pump was a major subject discussed in this panel session. Robert G. Werden, of York Corp., told of the new compound compression refrigeration air source heat pump that has been applied in two heat pump installations. (The article, *Below Freezing Air Yields Heat in New Heat Pump Systems*, in the June HPAC discussed these two installations and the principles of the air source heat pump operating in stages.) The compressors are switched automatically from single stage compression into compound compression when the outdoor air drops below a certain point.

John J. Floreth, also of York Corp., told about the large heat pump system that is being installed for the new Southdale shopping center in the Minneapolis area. Part of the cooling and heating source is derived from 50 F well water, and the refrigeration capacity will total more than 2200 tons. Reciprocating compressors will be driven by natural gas internal combusion engines.

With the design outdoor temperature for winter heating at −20 F, the engineering and planning that has gone into this system is very much out of the ordinary. For instance, all of the heat from the gas engines will be conserved, including the heat from the exhaust gases and that from the water jackets. At −20 F outside, this heat pump system will make available for heating approximately 1.37 Btu of heat energy for every Btu of heat energy supplied to the gas engines in the form of natural gas.

The water circulating and pumping systems have been designed to make the most efficient use of the well water. As an example, during summer operation the well water is first used to pre-cool outside air, and then is passed through the condensers of the central refrigeration system. From this point, the water passes through individual condensers of tenant air conditioning systems, then to remove heat from the gas engine jackets and mufflers, before finally being diverted to diffusion wells.

The control system is also unique in many respects. The operation of all ventilation, refrigeration and water pumping systems is intended to be as completely automatic as

PETER B. GORDON, right, New York, received the Distinguished Service Award from Wray M. Scott, Omaha, Neb., at the convention for "long and lasting service to the mechanical (heating, piping, and air conditioning) contracting industry." It was under Mr. Gordon's direction that material on both radiant panel heating standards and snow melting was developed. The award winner has served as chairman of the association's radiant panel heating committee since its inception in 1946, and also heads the committee on standards. Mr. Gordon is first vice president of the American Society of Heating and Air-Conditioning Engineers and vice president of the mechanical contracting firm of Wolff & Munier

possible. This includes the starting and stopping of all fans, pumps, refrigeration compressors, and tenant systems to maintain satisfactory temperature and pressure conditions throughout both the day and night operation of the Shopping center. The adjustment in capacity of the heat pump system during transition from daytime winter heating to night time winter heating after the center has closed, will also be automatic. The electronic control system developed especially for this project represents the latest thinking for controlling heating and air conditioning systems.

This project is scheduled to be completed in 1956.

Apprentice Training Stressed

A newly formed National Joint Pipe Fitter Apprenticeship committee was announced by Grant J. Hayes, chairman of the apprenticeship committee, during the panel discussion period on this subject. This new committee will consist of five members from the contractors association and five members from the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the U. S. and Canada. The new committee will be responsible for maintaining an up-to-date apprentice training program throughout the U. S.

Mr. Hayes reported that several supplements to the Instruction Manual for Steamfitter Apprentices had been revised and made available in published form.

Supplements now available are:

a) No. 1, Isometric Drawing.

b) No. 3, Fuel Burning Equipment.

c) No. 4, Air Conditioning and Refrigeration.

d) No. 6, Panel Heating.

e) No. 8, Use and Care of Tools and Equipment.

Seven additional supplements, to be available after October 1, 1956, are:

f) No. 2, Requisitions.

g) No. 5, Pipe Bending.

h) No. 7, Rigging.

i) No. 9, Water Heating and Cooling Systems.

j) No. 10, Hydraulics.

k) No. 11, Controls.

l) No. 12, Instruments.

Also, Volumes I, II, and III of the Instruction Manual for Steamfitter Apprentices are being revised and should be made ready for publication during the coming year.

The third annual International Apprentice Contest sponsored by the UA will be held at Purdue University on August 6 — 10. Two separate contests are being held, one for pipe fitting and one for plumbing apprentices. First, second, and third place winners in each contest will receive $1000, $500, and $250, respectively. Competing will be fifth year plumbing and pipe fitting apprentices who are winners of state or provincial contests.

Joseph P. Corcoran, apprentice training director for the UA, also announced that there will a be teacher training program at Purdue university during the same week.

Approve National Policies

One of the major actions of the convention was the approval of a set of stated national policies for the association. These policies were adopted as guides for action by all members in their dealings with organized labor, general contractors, engineers, architects-engineers, suppliers, government agencies, and the public. The policies affirm the association's stand on trade practices, welding, standards, and trade promotion.

Featured in the policy on labor relations is the stand that the interest of all participants — public, management, and employee — must be considered in all problems, and that every available means must be exhausted to amicably settle disputes on the local level. The association also affirmed its continuing support of the Industrial Relations Council for the Plumbing and Pipe Fitting Industry, and the National Joint Board for Settlement of Jurisdictional Disputes. The association also called for no artificial limitations on the output of the individual worker or on improvements in industry techniques. It called for continuing support of apprenticeship training programs as a means of improving the contribution the industry makes to the comfort and economic welfare of the nation.

The association also recommended

FIRST PRESIDENT of the new Mechanical Contractors Association of America, George Hall, second from right, president of Hyland, Hall & Co., Madison, Wis., is congratulated by Edward Jungbert, second from left, last president of the Heating, Piping, and Air Conditioning Contractors National Association. Members voted to change organization's name at convention. Other new officers are treasurer Horace Wetzell, left, of the Smith & Oby Co., Cleveland, Ohio, and vice president Joseph H. Spitzley, right, president of the R. L. Spitzley Heating Co., Detroit, Mich.

Six members of the board of directors whose terms expired this year were re-elected for three more years. They are: Frank H. Haines, Washington, D. C.; Joseph S. Kearney, Evanston, Ill.; Frank V. McBride, Paterson, N. J.; William P. Scott, Jr., San Francisco, Calif.; Joseph H. Spitzley, Detroit, Mich., and Horace E. Wetzell, Cleveland, Ohio

to its members that they act as prime contractors whenever possible in order to better serve the public, it recommended that they should not sign contracts requiring the contractor to guarantee the performance of a system where the plans and specifications have been prepared by architects and engineers, but rather guarantee only workmanship and material. The association also stated its opposition to suppliers making engineering layouts and material-quantity tabulations and labor estimates.

Piping Standards Revised

Leon L. Munier, New York City, representative on the American Standards Association Council, reported that during the past year the following standards have been revised:

a) B31.1-1951, inc. Sup. No. 1, B31.1a-1953 — Revision to, Code for Pressure Piping.

b) B16.25-1955 — American Standard, Butt Welding Ends.

c) B16.23-1953 — Revision of American Standard, Cast-Brass Solder-Joint Drainage Fittings.

d) ASTM B-161-49T, ASA H34.1-1955 — Specifications for Nickel Seamless Pipe and Tubing.

e) ASTM B-165-49T, ASA H34.2-1955 — Specifications for Nickel-Copper Alloy Seamless Pipe and Tubing.

f) ASTM B-167-49T, ASA H34.4-1955 — Iron Alloy Seamless Pipe and Tubing.

The American Standards Association initiated a project last year on the subject of "Dimensional Standards for Plastic Pipe." This project has been formed under the sponsorship of the Society of the Plastics Industry and the American Society of Mechanical Engineers.

New "Mechanical Contractors"

The Heating, Piping, and Air Conditioning Contractors National Association formally voted at the closing session of their 67th annual convention to change the name of the association to the Mechanical Contractors Association of America. The name change will be effective upon completion of final legal arrangements for the merger of the old organization with the newly designated association; all measures will be completed with the filing of legal documents required to consummate the consolidation. As was pointed out at the 66th annual convention when the name change was initiated, the change was taken to aid the heating, piping, and air conditioning contractor in his relationship with owners and builders, as it will more clearly emphasize his contribution to the construction industry.

"Mechanical Contractors are contributing a larger share than ever before in the total construction costs of a project, whether for commercial, industrial, or other structures," said Lloyd B. Gruman, Jr., secretary for the association, in commenting on the name change. "These contractors are specialists in that they perform a highly skilled function, geared toward providing finer technical services for the builder. It is only fitting that such contractors gain the recognition of the widespread services," he said.

Member Dues Increased

Other action taken was to increase members' dues to allow the national office to further expand its services to the membership. Three new membership categories were also created: Class 7, members doing a volume of business annually from $2.5 million to $5 million, who will pay $400 annual dues; Class 8, members doing a volume of business in excess of $5 million, who will pay $500 annual dues; Sustaining Members — a special membership classification — who, instead of paying the regular dues, will pay $1000 annually.

Miami Beach Next Year

The headquarters of the Mechanical Contractors Association is scheduled to move to Washington, D. C., in the fall of 1957, it was announced at the convention.

Next year's convention will be held at the Fontainebleau hotel, Miami Beach, Fla., May 7, 8, 9, and 10. ≠

"Let's Work Together"

. . . in labor-management cooperation toward solving our problems and advancing the heating, piping, and air conditioning industry, says Peter T. Schoemann, general president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry. Summarized here is his speech before the recent 67th annual convention of the Heating, Piping, and Air Conditioning Contractors National Association.

PETER T. SCHOEMANN, general president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry, spoke on labor-management cooperation at the 67th annual convention of the Heating, Piping, and Air Conditioning Contractors National Association recently held in Louisville. He said the present annual dollar volume of the heating, piping, and air conditioning contractors' work is between $3 and $4 billion. Such a large share in the construction industry makes this phase one of the industry's vital supports today, he said.

"Atomic power, beginning to take the place of coal and oil as a fuel, is on the threshold of revolutionizing the utility industry. Hundreds of millions of dollars in new power plant construction are now under way or on the boards. The future can only promise a vast continuing expansion in this field, and I need not remind you of the tremendous amount of piping work which this will require," he said.

"Chemical plants and oil refineries are daily meeting constant change and invention which add to the great volume of piping work we are called upon to perform. In fact there is no apparent limit to the kinds of piping and related activities created for us by the scientist, the engineer, and the architect-engineer. The need for our skills increases and varies as modern ingenuity finds new uses for our craft in heating, ventilating, air conditioning, refrigerating, and all kinds of process and power piping.

"This feature of modernity in our industry creates a common bond between the UA and the Heating, Piping, and Air Conditioning Contractors National Association. Just as you first developed as a part of the industrial world during the final quarter of the 19th century, so did we. Just as you have grown with vigor over the years, so have we. Just as you are a strong and vital force within the construction industry, so are we within the house of building and construction trade unionism. We provide the skills without which you are helpless. You provide the leadership and business acumen which spells prosperity for us both. We are dependent upon each other for progress and success. We are equals in the business world — partners in our industry — necessary to each other's welfare — and we are both here to stay," Mr. Schoemann said.

"Mature recognition of these basic facts should produce — and I am confident that it has produced — a serious sense of responsibility on the part of both of our organizations. We are keenly aware that the prosperity of our industry is a matter of paramount concern. We must work together for its growth and progress. We must practice labor-management cooperation in the highest sense of that term," he said.

Requires Steady, Trained Force

Turning out an effective job requires a steady work force of competent journeymen familiar with all aspects of our craft, he said. "The UA has kept its eyes constantly directed toward this basic need and toward the one sound means of meeting it, namely apprentice training.

"I need not tell you about our national joint apprenticeship committees. Your organization has given splendid cooperation in this venture aimed at preserving and improving the skills of our craftsmen who are the very foundation of our industry. You have also given your moral support and helpful guidance to our annual international pipe fitting apprenticeship contests," he said.

"Although the UA has annually been spending hundreds of thousands of dollars on apprenticeship — money well spent — nevertheless we might as well recognize that we have barely made a start toward a sound and universally accepted training system. There are many areas where no sound training system exists. There are many programs which fail to give the apprentice the well rounded experience and education our industry requires.

Unskilled Men Join the Ranks

"I find year after year that our apprenticeship systems fall far short of filling the annual losses of skilled journeymen which inevitably occur. This can only mean that we are filling the vacancies in our ranks with craftsmen who do not possess the full skills of the well trained graduate apprentice. Poorer workmanship, lower efficiency, and higher costs can be the result. Not only the public but also the contractor and, ultimately, the union will suffer," he predicted.

"Most important of all, these conditions are cropping up at the very

time when the most exacting demands are being made upon our skills. Scientific changes — nuclear energy — have brought with them a need for new types of piping and new materials. Pipes must now handle greatly increased pressures and tremendous extremes in temperatures both hot and cold. New fitting and welding methods — smaller tolerances, more rigid standards — in fact, new skills are required today to build the refineries, chemical plants, and atomic power plants of tomorrow.

Must Give Rounded Experience

"Experience has shown us that apprentices cannot be properly trained by employers alone or by unions alone. The skilled craftsman must receive the major part of his training in employment — employment by many contractors on varied kinds of work. This calls for joint action under a joint system with contractors and unions assuming the duties of employing and training and providing instruction for the worker. Only in this way can we produce the kind of craftsman which our industry sorely needs.

"For these reasons it is my ambition to see joint apprentice training systems covering every local union in the UA. By 'joint,' I mean that the apprentice should be indentured to a committee composed equally of representatives of the local union and of the local contractors. The apprentice should serve under the supervision of this committee in the employ of as many contractors as are necessary to give him full and varied employment resulting in a well-rounded knowledge of his skills.

Depends On Local Organizations

"Establishing this type of training everywhere places heavy demands upon us as national organizations. But the heaviest burden falls upon our local contractors and our local unions. It is you as individual contractors in your own communities — and it is our local unions in these communities — who must make apprenticeship work. As national organizations we can encourage, promote, aid, and assist. But only as local organizations can we carry on the necessary day-to-day operations vital to training the fully skilled craftsman.

"We in the UA are attempting to give full recognition to this division of duties. Recently we have expanded our training functions by creating a training department for apprentices and journeymen. Joseph P. Corcoran is director of the new department. We are doubling the number of apprentice coordinators on our national staff. In this way, we are preparing ourselves for a stepped up program of assistance to local joint apprenticeship committees throughout the country.

"A good trade promotion program is one example. Some years ago we proposed creating local trade promotion committees to ensure that all phases of our craft are properly included in our contracts for construction or installation. If this single objective were reached, immediate gains would be reaped not only by our industry, through well earned profits, but also by the public, through better workmanship and a better product. This calls for a well planned selling job to persuade architects, engineers, factory representatives, and government agencies that they should, as a matter of self interest, use our services to the full extent. Here again, however, complete cooperation at the local level is vital to any lasting success.

"Another area of successful cooperation is the field of industrial relations. I am sure we have always shared a common objective of stable and harmonious relations in a sound and prosperous industry. In fact this common objective caused us to create in 1950 an industrial relations council, to which your organization has contributed a representative. This council was set up as means of last resort for the settlement of labor disputes in our industry which we have been unable to settle locally.

"Actually, the very existence of our council has had a salutary effect both as a preventive and as an inducement toward local settlement of disputes as they arise. I regard this as the basic reason why we as a council have been required to enter only three disputes since the day of our creation. I am a great believer in the continuing value of the council as a permanent instrument for preventing or settling costly work stoppages by voluntary and democratic methods."

UA Works for Progress

Departing from his prepared text, Mr. Schoemann clarified the position of the UA on a number of topics of interest to the association. Speaking of the union's position on the national agreement problem, Mr. Schoemann explained that the national agreement limited signers to only the specific type of installation designated, but that contractors holding an agreement with any local of the UA would find that agreement recognized in any locality where they wished to operate. The general president also pointed out that the signers of the national agreement agreed to pay 1c per hr for each hour worked by a member of the UA into an educational fund for apprenticeship training.

In discussing the workings of the merger between the AFL-CIO and the dispute over jurisdiction in industrial plant expansion, Mr. Schoemann said, "We are not opposed to a successful merger, but do not believe that we intend to give away, amend, or change the jurisdictional rights given to the UA by the American Federation of Labor 69 years ago." He went on to emphasize that he intends to preserve that jurisdiction.

"I can assure you that my efforts as general president of the UA will be directed toward discovering and using every practical means of furthering the welfare of the UA and its membership through cooperation with your organization. My experience has shown me that you, in your turn, will not hesitate to join hands with us in the interests of progress, harmony, and advancement in the heating, piping, and air conditioning industry," Mr. Schoemann concluded. ≠

Reports at the 47th annual meeting of the National District Heating Association show . . .

District Heating Enters New Fields

- **More space heated, plus other added load, not only increased steam sales, but spurred expansion of generating capacity.**
- **Upturn in new industrial customers in one area brought new emphasis on serving this group.**
- **Basic steam and hot water rates rose in seven out of 95 reporting cities. Fuel cost adjustments in rates increased generally.**

By John F. Collins, Jr.
Secretary-Treasurer
National District Heating Association

DRAWN by the broadened scope of the papers and reports of the technical committees and by the entrancing setting of the meeting in restored Colonial Williamsburg, Va., more members and guests of the NDHA attended the recent four day annual meeting at the Williamsburg Inn and Lodge than had come to any meeting in almost two decades.

At five technical sessions, 23 papers were presented covering the field from atomic energy for district heating to industrial steam supply from electrical generating stations. At seven breakfast sessions many interesting topics were considered informally. These popular sessions enable individual members to obtain the opinions of others working in the same phase of the industry on any particular problem.

Steam Sales Increase

Two committees of the association, the statistics committee and the sales development committee, annually compile and report figures which show the gains and losses in district heating.

This year Foster L. Stephens, Allegheny County Steam Heating Co.,

Pittsburgh, Pa., chairman of the former committee, reported:

1) An increase in annual steam sales due to more space being heated, other added load, and colder weather.

2) A small decrease in the number of customers and in billing meters.

3) A small decrease in the average gross revenue per M lb. This probably is due to reduced coal cost per Btu and increased sales per customer, both of which have this effect.

4) An increase in invested capital. This is mostly for increased generating capacity, since comparatively little was done in distribution.

5) A decrease in the percentage of spare boiler capacity.

6) No appreciable change in load factor, steam losses, or fuel handling costs.

The most interesting feature of the report of the sales development committee on new business in 1955 by Sterling S. Sanford, of The Detroit Edison Co., is the means used by his own company — the second largest in the steam utility field — to sell more new steam business in 1955 than in any previous year.

For a quarter century, the sale of new steam business by the company in Detroit had been confined to the downtown business area and fringes, steam being generated in the nearby district heating plants. In 1955 the company contracted to sell steam to five industrial customers and provided a new 1 mile, 10 in. and 12 in. high pressure steam line and

other facilities starting from its Delray electric power plant several miles from the downtown area. It is estimated that these customers will consume 919,000 M lb of steam annually and provide a revenue of $691,000 at a new low industrial rate. The company is now investigating the possibility of securing this type of business elsewhere on its electric system.

Net 466 New Customers

Mr. Sanford reported that in the 39 cities providing 1955 statistics, 510 new customers were added to the lines of the utilities. It was estimated that they would take 2,762,000 M lb of steam from the companies and bring them an annual additional revenue of over $3 million at an average rate of $1.15 per M lb. Although the number of new customers added in 1955 was less than in any other year of the last decade, their estimated steam use and annual revenue were higher than in any other year of the period.

A breakdown of the new customers shows:

- 26 percent at some previous time had been served.
- 54 percent were in old buildings being served for the first time.
- 20 percent were in new structures.

A further breakdown of six customer groups shows:

As in 1954, the group first in new revenue was that which includes factories, lofts, warehouses, printing plants, and warehouses. Second in revenue was the group including office buildings, banks, etc.

In 1955, 44 customers were lost in 10 of the cities reporting, decreasing the revenue of the utilities by $\$1/4$ million.

As a secondary result of providing steam service, the Philadelphia Electric Co. gained $67,000 in electric revenue as well as steam revenue. This did not occur elsewhere in 1955.

Adjust Capacity to Demand

Utilities in seven cities reported their boiler capacities were inadequate to serve additional customers, but they planned no additions to generating capacity in 1956. In four cities the available additional capacity is somewhat limited. In the 37 other cities reporting, the capacity is adequate.

The suppliers of steam in four cities in 1955 increased by 426,500 lb per hr their boiler capacity. In three other cities it is proposed in 1956 to increase boiler capacity a total of 1,000,000 lb per hr.

Another limitation to the addition of customers is the availability of distribution facilities. In 36 areas such equipment is adequate, in one location, inadequate. In 21 cities the utilities installed additional lines in 1955, and in 11 localities additions are planned for 1956.

Push Air Conditioning Use

For the first time, Mr. Sanford's report included information on steam for summer air conditioning. He found that adequate steam is available for such use at 37 locations, to a limited extent at seven others and unavailable at five others. Thirty-two utilities were interested in promoting this off-peak business but 16 were not.

Expands Industrial Service

In another paper Mr. Sanford gave more details of the Detroit industrial steam venture. He said that in 1941 the utility first agreed to serve steam to an industrial customer, a chemical manufacturing plant adjacent to the Trenton Channel electric power plant. This customer then required 40,000 lb per hr, but plant expansion has now tripled its original demand.

It was this experience which made the utility agree to supply steam from Delray to a copper and brass manufacturing plant, a truck axle forging and machining plant, a copper and brass bar and sheet mill, a steamship terminal and warehouse, and an army post, all having worn out boilers. For example, the axle plant — which had to have steam at 125 psi for its steam hammers — if it had not secured steam service, would have had to spend $\$1/2$ million for new boilers and plant changes in order to operate very long in the future.

The estimated demand of the five customers — 213,000 lb per hr — required building a 10 in. and 12 in. line a distance of 8200 ft to carry steam at 150 psi. The total out-of-pocket investment was $\$1\frac{1}{4}$ million. Also, it is estimated that the allocated boiler plant would have cost $1.4 million if it were necessary to install such capacity.

The steam rate for this high load factor industrial business is lower than for the commercial area downtown. For the first five-year period, the demand charge is $1.00 per yr per lb per hr of steam demand, with the same rate for each lb in excess, plus $0.52 per M lb of steam consumed, the latter adjusted on the basis of fuel cost. The resulting average price is $0.75 per M lb.

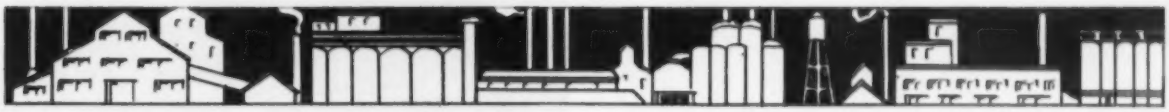
In practice, customers are using 7 percent more steam than estimated. One customer already has torn down his old plant to expand his manufacturing facilities.

Rates Rise in Seven Cities

The rates and regulations committee through its chairman, Clifford O. Thurlow, rate engineer of Commonwealth Services, Inc., Jackson, Mich., reported that there were increases in basic steam and hot water rates in only seven cities of 95 reporting statistics, less than half of the number increasing in 1954. In five cities the increases amounted to less than 10 percent of the revenue received under the superseded rates. In the other two localities the increases were more than 50 percent. There were no decreases.

A comparison of the fuel cost adjustments applicable in January 1956, provided for in nearly all rate structures, with those in effect 12 months earlier, revealed that the 1956 fuel cost adjustments mostly have increased.

Hot water service was discontinued in 1955 in one community and steam service in another. Steam service will



be terminated in another locality in 1956.

Seek to Reduce Steam Losses

For 10 or 15 years, the steam losses committee — now headed by Robert C. Wilson, of the Ohio Edison Co., Akron — has been investigating means of decreasing the amount of steam that leaves the generating plant but is not measured on the customers' meters. The best known of the items making up the loss is that due to heat radiating from the steam pipes.

To the company, rare nowadays, which makes a flat charge for steam service without the use of a meter, heat loss means something quite different from what it does to a utility at the far end of the scale which installs a meter on its plant header to measure customers' steam.

Replies to a question by Chairman Wilson as to new devices or methods being used effectively to reduce steam losses was the basis of this year's report. Suggestions offered included these:

1) Install a wide range plant send-out meter.

2) See that such a meter being used is of proper size.

3) Decrease plant send-out pressure.

4) Insulate bare heated equipment surfaces.

5) Investigate the source of losses.

6) Match increased losses due to aging equipment with increased vigilance.

7) Pay increased attention to leaks, customers' meters and equipment, especially to concealed piping.

8) Use condensate meters when practical. A condensate meter measures all condensate that reaches it but not all may do so. On the other hand, flow meters are accurate only within their range limits.

9) Change to a flow meter: (a) When piping inspection is infeasible; (b) When condensate from customer's equipment is uncollectible; and (c) When his pumps interfere with condensate collection.

10) Install downstream orifices to restrict flow to within the range of flow meters; smaller orifices for summer use.

11) Install a separate flow meter for process service.

12) Sectionalize the utilities' distribution system for a better check on measurement.

Association Serves Members

In his closing addresss as president, Vernon J. Suche, Union Electric Co., St. Louis, said the association is in excellent financial condition. He said that the papers and reports on the meeting program were those asked for by the member companies in replies to an earlier communication from him. He added, that after a thorough investigation, the executive board had decided it was better to keep the present unincorporated form of organization.

Secretary-Treasurer John F. Collins, Jr. presented a detailed financial report. He said that adequate steps had been taken to bring the cost of Proceedings within the budgets provided and that issues of the annual volume would be released more quickly in the future.

Following study and recommendation by the past presidents committee—of which Leo F. Collins, The Detroit Edison Co., is chairman—and by the executive board, the association adopted three amendments to the constitution and two to the bylaws. These are intended:

1) To facilitate non-utility suppliers of steam to join NDHA.

2) To assist geographical sections to build up their membership.

3) To make it easier to move the headquarters location.

4) To make it simpler to revise the bylaws.

Membership committee chairman Fred W. Deutsch, Builders-Providence, Inc., reported a good year in memberships and bright prospects for the future.

Completion of an up-to-date set of rules for the preparation and presentation of papers and reports was reported by David W. Loucks, of the Allegheny County Steam Heating Co., Pittsburgh, and chairman of the NDHA educational committee.

W. M. Gillespie New President

Following his unanimous election, Walter M. Gillespie, assistant manager of the steam division of the Dayton Power and Light Co., was handed the president's gavel at the closing session by retiring president Vernon J. Suche.

John C. Haroldson, vice president and treasurer of the Duluth Steam Corp., was elected first vice president; William G. Gillim, assistant superintendent of customer service of the Consolidated Edison Co., Inc., of New York City, became second vice president; and George F. Prestwich, superintendent, coal bureau and steam heating division of the Philadelphia Electric Co., became third vice president.

Three new association directors were elected for two-year terms. They are Albert A. Casey, general superintendent of steam power, of the Cleveland Electric Illuminating Co.; John D. Lemon, administrative assistant of the Indianapolis Power & Light Co.; and Leroy H. Plum, manager, engineered products division, Warren Webster & Co.

Five other directors—past president Vernon J. Suche, Secretary-Treasurer John F. Collins, Jr., Norman H. Davidson, Albert F. Metzger, and William R. Owen—continue in office.

[*Reports on the technical papers presented will be published in a future issue of HPAC.*—Ed.]

Atomic Fire 'Goes Out' in Sheraton-Park Plans

. . . quenched by technical manpower shortage and unavailability of adequate insurance coverage

"A VERY ACUTE shortage of qualified technical manpower" and the problem of insurance have "put out" the atomic fire in the rehabilitation plans of the Sheraton-Park hotel, Washington, D.C. An atomic power reactor which was being considered to provide heating, air conditioning, and electric power and lighting for the hotel has been dropped as an economic impossibility at the present time.

Commenting on the situation, Elliott Earl, partner in the management analysis firm of Wilson & Earl and the hotel's counselor in the matter, said, "The likelihood of making a profitable investment in an atomic power reactor for the Sheraton-Park is remote at this time."

Qualified Engineers Scarce

As to manpower, the management firm was unable to recruit "the preliminary seasoned and mature engineering design and specification writing force" for the proposal.

Furthermore, the firm was unable to recruit or find seasoned and mature hotel power plant operating personnel who would be willing to spend the time and do the studying necessary to qualify for an atomic power reactor operator's license, said Mr. Earl.

Can't Get Insurance Coverage

As to the money aspects, the proposal presented no great problems except for insurance. Several banks were quite interested in the idea of financing it, he said.

But the analysis found that adequate insurance coverage was not available at this time, in view of "circumstances and the law."

Among other problems that would affect the practical operation of an atomic fired boiler on the hotel grounds, Mr. Earl said, are these:

- Third party public liability insurance.
- Workmen's compensation insurance.
- Product liability insurance.
- Public acceptance.
- Specific site selection.

How to Shield from Radiation?

The only great material problem of construction and design that raised some doubts was radiation. "But," said Mr. Earl, "we think that as of the time of actual construction of the reactor these problems would have been disposed of, particularly in view of the huge sums being spent by the AEC and private industry.

Technically Feasible Now

Concerning the feasibility of an atomic power reactor having "adequate technical characteristics" to carry the heating, air conditioning, and electric power and lighting loads of the hotel, the firm has no doubt that such a machine could be made now, "at a cost per kilowatt of capacity competitive with existing conventional sources of power."

The preliminary engineering and design expense for such a plant would be "roughly 30 percent in excess" of professional engineering practice and "might run as high as 50 percent," said Mr. Earl.

Availability of fuel — uranium or thorium — is not considered a factor, since this problem has been "temporarily solved" by the release early this year of 40,000 kg of U-235 by President Eisenhower for the development of atomic energy for peaceful purposes. ≠

Packaged Air Cooled Condensers

. . . discussed at 52nd annual meeting of the American Society of Refrigerating Engineers. Here are abstracts of four of the papers presented.

Packaged or Central Type Best for Big Buildings?

. . . selection criteria given

PACKAGED air conditioning units, which came upon the scene in 1937, encouraged the growth of the mass market by bringing air conditioning economically within consumer reach, said F. C. Wood, district manager, industrial division, York Corp., Atlanta, Ga.

The packaged system has the economic advantage of adaptability to a "step program" of conditioning and provides maximum continuity of capacity in the face of partial shutdown for repairs, he said. "It generally can be more quickly installed, initial cost is usually lower, ducts are smaller, hence less conspicuous, and requires less auxiliary horsepower."

The central plant by deliberate design is better able to produce the ultimate in comfort, provide better air filtering, and operate at a lower noise level, he said.

The central plant provides more comfortable winter heating, is more flexible in adaptation to new buildings, has longer useful life, less and easier maintenance, and simpler and less-disturbing-to-occupants operating supervision, he said.

"The central plant is best applicable for new buildings above 100 to 150 tons capacity, for existing buildings where possible income justifies a long term investment, for year 'round air conditioning, and for more permanent types of installation.

"The packaged equipment system is best applicable for buildings of medium tonnage, for step-program air conditioning where equipment is owned by tenant on short lease, and where it is physically the most practical system," he said.

Air Cooled Condensers Solve, Raise Problems

. . . no uniform standards seen

SEVERAL aspects of design and installation of integral horsepower air cooled air conditioning equipment were discussed by Justin Neuhoff, manager of the commercial and industrial air conditioning department, General Electric Co.

When self-contained air conditioners were first sold in the late '30's, practically all of them were water cooled, he said. As water became increasingly scarce, the first move was to go to the use of cooling towers.

The cooling tower was not the whole answer. It had several problems, including corrosion of the tower and its parts and the liming of the condenser, since few cooling towers were treated to prevent scaling then.

One type of water saving device circulates the condenser water in a finned coil over which outside air is blown. This device has the advantage, he said, of using a closed water circuit, which eliminates the scaling problem and permits the manufacturer to build only a water cooled unit. But the dry bulb temperature must be used instead of the wet bulb temperature.

Air cooled condensers solve some of the problems but introduce a few of their own. The problems of corrosion and scaling are eliminated and no pump is required to circulate water. But again the dry bulb temperature must be used, he pointed out.

"Where the air cooled unit can be made as a self-contained device, the piping is straightforward and relatively simple. But where the condenser and evaporator are remote from each other, there is a problem of running refrigerant piping. This is a problem at times in some areas because as the air conditioning industry has expanded there are fewer skilled installation mechanics available per unit installed. Also, it is more important than ever that this installation be done properly — now that hermetic compressors are almost universally used — since the hermetic compressor is sensitive to the presence of moisture and other contaminants which can be easily introduced into the system during installation, unless precautions are taken," Mr. Neuhoff said.

In the past, he said, air cooled commercial refrigeration was generally installed in a cellar or a back room, and the quantities of heat to be rejected were relatively small. "The packaged air conditioner tries to cool the space and not just a commercial box, so it must reject the heat to outdoors. This means the condenser can be on the ground but more likely will be on the roof. Most condensers are designed today to operate at outdoor temperatures up to 115 F, recognizing that even though design temperatures are considerably lower, unusual conditions such as

stagnant air require a little extra safety factor.

A survey of the design practices of seven of the larger companies who manufacture self-contained air conditioning units shows considerable divergence of opinion concerning many of the design parameters, he reported. All companies are using copper tubing and aluminum fins for their condensers, but from this point of agreement the individual design of each of the companies shows considerable variation. For example, the number of coil rows varies from two to six. The volume of condenser air per ton of air conditioning capacity varies from 615 to 1170 cfm with a median of 900 cfm. Air face velocity is from 280 to 605 fpm, with a median of 455 fpm. The actual area of surface per ton is from 124 to 222 sq ft, with a median of 151 sq ft.

Most of the units balance out at around 125 F condensing temperature when the air supplied to the condenser is 95 F, but there is still a variation of from 117 to 130 F in the range.

Condenser fan kw, which can be an important part of the total operating cost, is reasonably consistent around a median of 0.16 kw per ton. One unit, however, was reported to be drawing twice that power.

The industry seems far from being ready to accept any standard figures for cfm per ton, face velocities or total surface, Mr. Neuhoff said, since — depending upon the design — any of these figures can be varied. "The most efficient air cooled condenser, considering all factors such as air flow, initial cost, and noise level, has yet to be designed."

New Field Application Problems Discussed

. . . sees "broad" problems

SOME of the "broad" problems of packaged air cooled heat rejection equipment were discussed by M. D. Irwin, manager of the Weathermaker product engineering department, Carrier Corp.

It is the responsibility of the design engineer and the application and service engineer to do as much of the pre-planning as possible, so that this equipment can be easily and safely applied and installed so that maximum user satisfaction will result, he said.

Several problems he discussed are:

- Installation guidance based on experience to date, particularly with popular models.
- The control of head pressure, both under high outdoor air conditions and thus required for its load limiting aspects, and under low outside air conditions with an unrelated internal load, being required for adequate system performance.
- The problem of refrigerant charge migration resulting from low sweeps in outside ambient temperatures and its effect on crank case dilution, operational start ups, and methods to safeguard against adverse effects therefrom.
- Air cool design conditions and limitations applied thereto.
- Capacity variation, its effect on equipment selection, operating cost.

Speed Calculations for Crossflow Cooling Towers

. . . by analytical method

AN ANALYTICAL method for calculating the water temperature distribution in a crossflow cooling tower was described by S. M. Zivi, head of the engineering analysis section of the Midwest Research Institute, Kansas City, Mo. Bruce B. Brand, chief engineer, Havens Cooling Towers, Div. of Havens Structural Steel Co., Kansas City, Mo., was co-author of this paper.

The method utilizes enthalpy difference as the driving force, similar to analyses for counterflow cooling towers; however, the crossflow arrangement introduces considerably greater complications than the counterflow case. The computation is handled by representing the fill as a grid, and deriving mathematical relationships between conditions — temperatures and enthalpies — at adjacent points in the grid. The theory and results from computations for several typical temperature conditions were included.

The procedure has two primary uses: "(1) It permits the comparison of test data on different designs, tested under similar but not identical ambient conditions. (2) It can be used to extend test data observed at several temperature levels to obtain tower performance over a very wide range of temperature and flow conditions."

The procedure is particularly well suited for automatic computation but it can also be carried out without the aid of a high speed computer, Mr. Zivi said. Once the temperature contours in the tower fill have been calculated, they may be applied to towers with any fill design, water flow rate, or air flow rate by proper evaluation of the tower's parameters in accordance with the procedure described, he said. ≠

Air Conditioned Cabs Speed Cargo Delivery

AIR CONDITIONING installations in tractor cabs are saving a full day's driving time transporting urgent cargo from the Chance Vought Aircraft plant, Dallas, Texas, to Edwards Air Force Base, Calif., 100 miles northeast of Los Angeles, a distance of 1443 miles. This time saving represents a saving in operational cost of between $50 and $60 per trip, according to Grant Bunnell, manager of traffic at Chance Vought.

Drivers can now stay safely and comfortably at the wheel for 150 miles at a stretch on the severest summer days and—not figuring depreciation—the amortization of the cost is about five trips to the coast.

Drivers use the air conditioning 10 months of the year. ≠

LETTER FROM LONDON

Electric Space Heating Encouraged in Britain

. . . to increase off-peak electric loads from 7 p.m. to 7 a.m. Floor heating panels in early postwar construction—mainly municipal and commercial buildings—consist of concrete embedded conduit through which electric cables were drawn. Since then, however, panels consisting of small plastic covered, steel stranded cables, buried on the slab in 1½ to 3 in. dense concrete screed, have come into use, especially in large housing projects. Another method, known as the thermal storage block heater, is used to heat existing small stores.

By Lester S. Ries

Formerly Superintendent Buildings and Grounds Oberlin College

DURING the seven weeks I have been in England, I have visited numerous colleges and have been given the opportunity of speaking with several heating and ventilating engineers. The colleges generally are embarked on extensive expansion programs that include much new construction. Imperial College of Science and Technology—just south of Kensington Gardens—has begun construction on a six year program estimated to cost £20 million—$56 million at present rate of exchange—and is by far the most ambitious expansion projected in the Empire. It is intended to increase the enrollment from the present 950 students to 2000. I am to meet with Dr. Stanley Sparkes, who is directing this program, to discuss what improvements in heating, ventilating, and air conditioning will be incorporated in the new buildings.

The author, who has had several articles on college heating and ventilating published in HPAC over the past 21 years, is now on leave from Oberlin college for special study in Britain.

Also I am to meet with W. L. Swain, chairman and managing director of the engineering and contracting firm of Young, Austin and Young, Ltd., and with H. H. Bruce, technical director of the Invisible Panel Warming Association.

Offer Rate Inducements

You will be interested in recent trends and developments in electric heating in England and Scotland. E. M. Ackery, of the British Electrical Development Association, collaborates closely with the 12 national boards of electricity in England and the two in Scotland in the promotional work of the association. Every effort is made to control the use of electricity on the island because of the limited generating capacity and the impossibility of expanding present capacity by any large percentage soon.

Rate inducements are general to encourage electric heating loads on the off-peaks, which are considered to be from 7 p.m. to 7 a.m., and with several of the boards from noon to 2 p.m. in addition.

Prewar System Outmoded

Before the second world war, electrical heating was largely confined to large thermal storage systems requiring large electrode boilers and huge hot water storage tanks. The capital cost of such an installation is great.

One such installation which I inspected is installed in the University of London development in Bloomsbury and serves their new Student Union of 563,000 cu ft and Birbeck College of 1,275,000 cu ft. It has one 3500 kw electrode boiler and two 22,500 gal storage tanks which are heavily insulated. The cost of such installations was large and, after the war, became prohibitive.

Improve Electric Floor Panels

New construction to replace bomb damage began on a large scale after 1950. The first buildings to be erected were mostly those needed for municipal and office purposes. Where electric space heating was installed, floor heating panels were used exclusively. The first method was to embed conduit in the concrete floor through which electric cables were drawn. The second method, which superseded the first, was to bury a small plastic covered steel stranded cable—locally called "pyrotenax"—on the concrete of the floor slab, covering the cable with 1½ to 3 in. of dense concrete. This latter system

has the advantage of low capital cost, but both methods are much less costly than the thermal storage system of prewar days.

Much of the new housing now being constructed is in large blocks—of 50 to 60—called "flats." In some cases the floor buried electrical cable is being installed with off-peak protection furnished, serviced, and installed by the electrical board and consisting of one time switch for an entire block. The heating service is on a separate circuit from the rest of the building services, and each tenant is on a separate meter. The installation is sized on the basis of 10 to 12 watts per sq ft of floor. The advantages of this system are: the cost to the owner is low; the tenant controls the heat he requires, the current is metered for this amount of heating, and he pays the bill. The British object to having heating costs included in their monthly rent. It must be added, however, that the overall volume of electric panel heating compared with the total number of buildings being constructed is very small indeed.

Most Prewar Shops Had No Heat

Before the war it was quite unusual to have heat in any of the small stores or shops. Since the war there has been a demand for some heating, moderate to be sure, in such establishments. A scheme for heating existing buildings electrically has been developed and is in use, known as the thermal storage block heater. This consists of heating a chunk of concrete by electric resistance cable on the off-peak period and dispensing the heat in the space during the day. To be sure there is a rapid falling off of the heat emission, and toward the afternoon the concrete block is very nearly the temperature of the space around it. In theory this device is very crude and unsatisfactory, but in practice it works pretty well.

The thermal storage block heater is made by surrounding the electric resistance heater cable with heavy blocks of concrete, in turn covered with a layer of heat insulating material and the whole enclosed with a pressed steel casing. It looks like a conventional convector but is exceedingly heavy; the 1 kw unit weighs about 250 lb, and the largest on the market of 2¼ kw input weighs nearly 500 lb. The thermal storage block heater is not permitted to be sold or installed for domestic use.

See Atomic Energy Fuel Soon

British national boards of electricity consider space heating loads quite desirable so long as they are off-peak. With the advent of atomic energy as a substitute fuel—considered quite imminent here—plans to stimulate off-peak use of electricity for space heating are being formulated.

I hope to have additional observations on space heating in Britain in my next letter. ⧺

READER ASKS—

"What Caused Joints to Fail in Copper Tube Heating Main?"

"I am interested in getting some factual information about the possibility of trouble arising from the installation of Type L hard copper tube as a heating main with copper fittings in the hot water heating system in a basementless structure built on a concrete slab. The tubing is installed below the concrete slab in the 2 ft of gravel fill under the slab.

"The 1 in. hard tubing is about 3 in. below the bottom side of the slab. A layer of felt paper was applied over the gravel prior to the pouring of the 4 in. slab. Therefore, no concrete was permitted to be in contact with the copper tube. All runouts from the heating main to the sections of cast iron baseboard are Type L flexible tubing, also covered with heavy asphalt covered felt paper to prevent the concrete from contacting the tubing. All soldered joints were cleaned thoroughly with sand paper, steel wool, flux, and then 50-50 solder was applied. The temperature of the water in the heating system varies between 160 F and a maximum of 210 F.

"After the system had been installed three years, a leak developed in the main. In removing a section of the concrete floor, we found that the tubing at one end of the joints had broken the soldered connection and was pulled out of the fitting about ⅜ in. It seemed that there was not as much solder as there should have been at the soldered joints, and in some places, the solder was so thin at the joint that the tubing could be seen.

"I would like to have answers to the following questions and any comments that HPAC readers would like to make about similar experiences that they have encountered. I would like to have as many facts as possible.

"1. Is it possible that galvanic action or some other electrolysis action is taking place between the gravel, the copper tube, the hot water, and the solder which would tend to weaken the joint and remove the solder?

"2. Is it possible that the temperature of the hot water is too high and that this is causing the joint to lose its strength over a period of time?

"It is my theory that with the heating main installed in loose gravel and not in contact with the concrete, it would be able to expand and contract without causing any great amount of pressure on the soldered joints. In the expansion of the tubing, the tubing would be pushed farther into the fitting, so the leak was undoubtedly caused when contraction took place as the tubing cooled.

"We have done many jobs of this type and have used various combinations of flexible tubing with flared fittings, and up to this time we have experienced no trouble except on this installation."—R. P. W.

• *YOU ARE INVITED to contribute a question for publication or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2. For this month's question, with answers,* *turn to page 124.*

The Law and Your Profits

By William Hurd Hillyer

Avoid Contributory Negligence

If installed equipment is unsuitable from the start, contributory negligence on the part of the owner is uncertain ground for a heating, piping, and air conditioning contractor's defense in court, as this case shows.

When E. Reck Talltowers, owner and builder, let the heating contract for his new apartment building to Calefax Co., Calefax subcontracted the burner installation to Lambent Bros., exclusive local distributor. Difficulty from the time the burner was first turned on resulted in 15 service calls to Lambent in 60 days "to start the burner and make adjustments."

Talltowers one morning found the boiler room full of smoke and soot, the boiler door open, and the burner out. Smoke and soot had reached the upper floors and spoiled apartment interiors.

Talltowers collected insurance and renovated the building. He continued to use the burner through the next four years, but mounting difficulties ended in a second "explosion" before he sued Calefax and Lambent.

He called Oylburn Service Co., who sent Willie Fixwell without delay. Finding the wires next to the burner and an enclosed terminal block burned out, Willie put in temporary wiring so the burner could be started.

Talltowers next called Henry Seazall, engineer familiar with that type of burner. He found the motor for the oil recirculating pump "inoperative," and noted "no voltage" at the electric preheater terminals, although the preheater itself was "all right." Seazall fixed the pump and then installed a new "bypass" line. In court he testified that its purpose was "to have less oil dormant in the system when it was not running, so that less oil would cool off and become too viscous."

When the burner was not operating, the oil kept going from the preheater — hot water coils attached to the boiler — to the tank, whence it continually recirculated, whether the burner was on or off. However, when operating, the burner pump drew oil from the circulating line into another, electric, preheater for further heating before vaporization and combustion.

Seazall testified that the first "incident" happened because the electric eye, installed as part of the equipment, operated erratically and because the oil delivered to the burner was "cold." The second incident he blamed upon the oil piping, plus the inoperation of the preheater. Between the two explosions, the electric eye — designed to shut down all the mechanisms if it did not "see" any flame — was removed by Lambent Bros., and a "stack switch," actuated by heat, was used instead.

Heating contractors Calefax Co. and subcontractors Lambent Bros. were sued by the insurance companies for reimbursement of loss paid, and by Talltowers for consequential damages, plus loss of rent while the building was untenantable. Losing, the contractors appealed to the state supreme court on the ground that the trial judge should have instructed the jury as to "contributory negligence" and should have granted the defendant contractors' motion to set aside the verdict.

Contributory negligence, therefore, is the substance of this case, despite the lower court's omission. The higher tribunal cited the rule: ". . . A buyer who uses the article after he discovers the danger will be held to have assumed all the risk of damage to himself, notwithstanding the seller's assurance of safety . . . It is generally for the jury to determine whether, under the circumstances, the buyer was contributorily negligent in relying on the seller's assurance."

The supreme court said that the contractors were entitled to have the jury instructed that the owner could not recover unless the jury found that the explosions were due to the failure of Lambent Bros. to install the pipe later installed by Fixwell, and then only if such installation was part of the "ordinary good workmanlike" performance required of them under their contracts.

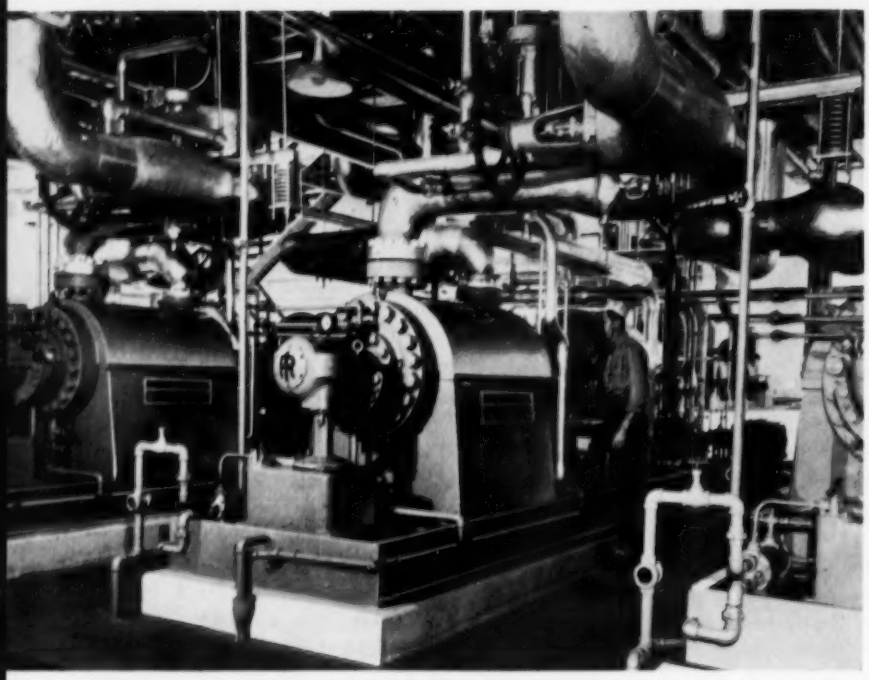
As it turned out, the heating contractors and codefendants were lucky enough to win a reversal of the lower court's decree. The trial judge, however, had told the jury that if the "incidents" occurred because of breach of agreement by Lambent Bros., "the defendants are responsible for all the consequences, even though some failure" on the owner's part "properly to maintain the heating plant also may have contributed to causing the incidents." Both defendants would be liable. ⌖

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., he has an extensive practical legal background.

This series presents actual cases. Naturally, laws vary in different states.

All names are fictitious.

Boiler Feed Pumps:



1 BOILER FEED PUMPS installed in accordance with good engineering practice and with careful attention to details will result in trouble-free operation

By Lewis J. Dawson

Engineer
Cameron Pump Div.,
Ingersoll-Rand Co.

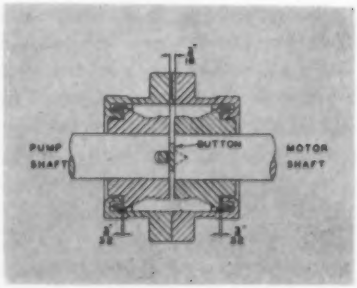
Boiler feed pump installations run more smoothly with these four problems solved:

1. Application of limited end float couplings on standard pump motors.

2. Provision of effective oiling systems for long pump and motor units.

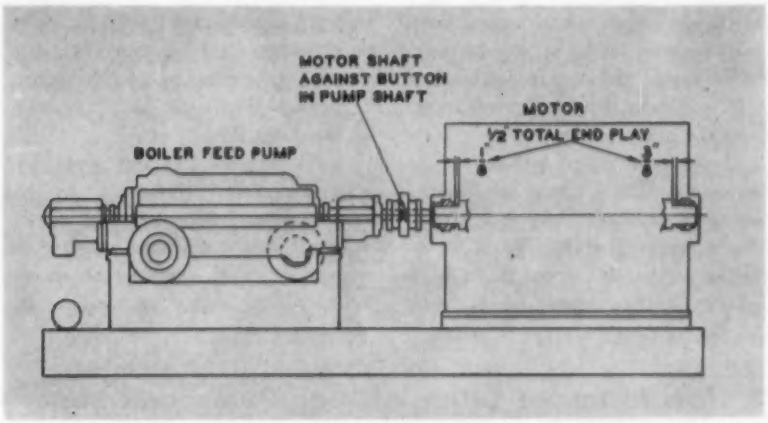
3. Provision of minimum flow protection in multistage pumps.

4. Correct installation of feed pump warm-up lines.



2 BUTTON REDUCES END PLAY of standard gear type coupling. With the motor shaft against the button in the pump shaft, each coupling hub is 3/32 in. from the bottom of its machine cover

4 Special Problems...Their Solutions



3 OVERALL LINEUP, with the motor shaft contacting the button, has inboard motor shaft collar set ⅛ in. off its bearing so that it cannot rub if the motor rotor throws toward the pump

1. How to Apply Limited End Float Couplings to Standard Pump Motors

LIMITED end float couplings are a relatively recent development in boiler feed pump installations.

Checking complaints of motor bearing trouble on multistage centrifugal pump drivers revealed that the end surfaces of the motor bearings were being wiped. Thrust from the pump, one theory went, caused the shoulder on the motor shaft to dig into the end of the motor bearing. But the pumps were equipped with a duplex ball or Kingsbury type thrust bearing so that pump rotor movement was restricted to 1/32 in. maximum. Another suspect was the gear type coupling, which was said to "spread" or "creep" due to slight misalignment, but these claims could not be substantiated.

Actually, when the motor is energized, the starting current inrush causes the motor rotor to throw to one end of the motor travel, so that the shoulder on the motor shaft is rubbing the end of the bearing. The torque load on the coupling teeth multiplied by the sliding coefficient of friction results in a holding force greater than the magnetic centering force of the motor, so the motor shaft shoulder continues to run against the end of the bearing. In general, this bearing face is non-lubricated, or poorly lubricated, as it is only intended for a limit stop. The situation is aggravated by any expansion of pump and motor shafts due to heating up; that is, it is aggravated if the outboard motor bearing is rubbing, and relieved if it is the inboard bearing.

There are two obvious solutions: (1) Build into the motor enough thrust capacity so that the coupling teeth will slide and the bearing loading will be relieved. (2) Limit the motor rotor travel so that the shaft collar cannot contact bearing ends.

The extra cost of a non-standard motor providing a thrust bearing has led to a limited-end-float arrangement as a means of obtaining a flexible coupling with inherent motor rotor positioning.

The theory is to provide more end play in the motor than in the coupling so that the motor shaft collars never contact the bearings. To accomplish this requires increasing the standard motor end float and decreasing the standard coupling end play. Most jobs today have ½ in. motor float and 3/16 in. coupling play. The end play of a standard gear type coupling is reduced by means of a button in the end of the shaft as shown in **Fig.** 2. If normal coupling play is ⅜ in., a 3/16 in. shaft as shown in Fig. 2. If normal play. In other words, with the motor shaft against the button in the pump shaft, each coupling hub is 3/32 in. from the bottom of its mating cover. Or, if the shafts were pulled apart until the hubs bottomed in the covers, there would be 3/16 in. between the motor shaft and the face of the button.

On a spacer coupling, plates must be used to limit the travel.

Abstracted from a paper presented by the author at the recent 18th annual American Power Conference.

The overall lineup is shown in Fig. 3. With the motor shaft contacting the button, the inboard motor shaft collar is set ⅛ in. off its bearing so that it cannot rub if the motor rotor throws toward the pump. Taking ⅛ in. off the total motor float of ½ in. leaves a ⅜ in. gap between the outboard collar and bearing.

When the motor rotor moves away from the pump, it can only go 3/16 in. before the coupling float is all taken up. Under these conditions, the motor shaft shoulder is 5/16 in. off the inboard bearing and 3/16 in. off the outboard bearing. Even with 1/16 in. shaft expansion, ⅛ in. clearance is still left on the outboard end.

When pumps have a hydraulic coupling between the pump and driver, the hydraulic coupling is called on to restrain the motor rotor. The coupling between the motor and hydraulic coupling is limited end float, whereas the coupling between the hydraulic coupling and the pump is standard. Hydraulic couplings have an adequate thrust bearing.

A recent job involved a step-up gear and motor driver made by the same company. The gear had a very small thrust capacity and couldn't be depended on to position the motor rotor. So, we ended up with ½ in. end float in the gear, ¾ in. in the motor and 1/16 in. limited end float couplings at each end of the gear.

Limited end float set-ups have some disadvantages. Such a tricky set-up is hard to explain to a construction crew via an outline drawing. More lasting, there is bound to be some chafing of metal when the motor shaft is running against the button, and these metal particles are trapped in the coupling lubricant.

All in all, it would certainly be a better job if the motor bearings were adequate to carry the required endwise loading.

2. How to Insure Oiling of Long Pump and Motor Units

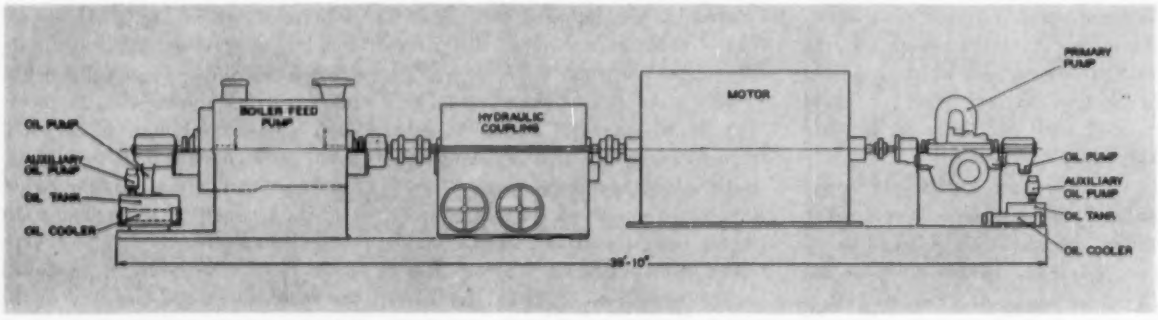
WHEN a boiler feed pump set consisted of a pump and driver and the overall length was less than 20 ft, oiling systems were not much of a problem. Usually on a motor driven unit the oil for both pump and driver was furnished by the pump oiling system, with the reverse being the case when a turbine driver was used.

With longer pumps, larger drivers — due to higher pressures — and hydraulic couplings in between for speed regulation, overall lengths became 25 to 30 ft. Double extended motors, with a booster or primary pump on the far end adding another few feet to the oiling system, present two problems: (1) the time delay in filling the oil supply system; and (2) the drainage problem.

The problem of time delay in filling the system is easily overcome by the addition of a motor driven auxiliary oil pump, usually a small vertical centrifugal with the pumping element submerged in the oil sump. The control circuits can be interlocked so that the feed pump cannot be started unless the auxiliary pump is running and the oiling system is pressurized. An auxiliary oil pump set to cut in at low oil pressure is a valuable safeguard if the main oiling system should fail for some unforseen reason.

The oil drainage problem is not so easily solved. Since the height between the oil outlets from the bearings and the oil level in the sump is fixed, the longer the unit, the less the pitch of the return line. The size of the return line can't be increased indefinitely. If the sump can be located near the middle of the length of the unit, producing two short runs of returns, there is no problem. Hydraulic couplings are not a good source of bearing oil, but if the length is due to a step-up gear, it is quite feasible to have the gearset supply the oil to both pump and driver and have a centrally located sump. Failing to have a central source and sump, two separate systems may be required, one for each end of the unit.

A pumping unit consisting of a boiler feed pump, hydraulic coupling, double extended motor, and constant speed primary pump is shown in Fig. 4. Each pump has its own oiling system, and the primary pump system oils the motor.



4 SEPARATE OILING SYSTEMS serve boiler feed pump, left, and constant speed primary pump, right, in this pumping unit, which also includes hydraulic coupling and double extended motor. Primary pump system oils the motor

3. How to Provide Minimum Flow Protection in Multistage Pumps

A MULTISTAGE PUMP needs minimum flow protection. But what type is best: manual, automatic fixed capacity, or automatic modulating?

Any manual control left to the discretion of an operator may be a hazard. With normal switching of pumps or periods of light load, there is plenty of time for the operator to open the bypass valves, but what happens on a sudden load dump? Too many other things demand attention to insure that the bypass valve will be opened promptly.

Of course, on small jobs where a little loss of horsepower is not critical, the bypass can be left open all the time. Indeed, on some industrials subject to constantly fluctuating feed pump demand this is the best possible solution. The orifice should not be located right next to the operator's ear, however, because breaking down pressure creates noise. A knotty problem on the atomic powered submarine was a squealing orifice which could be picked up on enemy sonar.

There is no questioning the value of a automatic bypass control on large jobs. The most popular set-up consists of a full open or full closed diaphragm actuated valve in series with a multiple plate orifice. The diaphragm air is supplied by a pilot which is actuated by the feed pump flow meter. On high temperature and low NPSH feed pump jobs this may get a little clumsy due to the fact that safe minimum flow may be as high as one-third of rated pump capacity. With the orifice selected for one-third rated flow and the cut-in point at one-third flow, a lot of water whistles back to the heater, and there is quite a pressure jolt on the feed header when the valve opens on the way down or closes on the way up.

The ideal system would be one in which the bypass line would pass the difference between the safe minimum flow and the flow going out the discharge nozzle. This requires a modulating type of valve in series with the multiple orifice. With the valve wide open, the orifice passes the safe minimum flow for zero feed header flow conditions. As the boiler calls for water, the valve in the bypass line begins to throttle, thus reducing the pressure across the orifice and hence the flow. Or, the valve may take the full drop with no orifice in the line. Several types of modulating systems have been successfully installed.

One firm in England has worked out a bypass control actuated by the temperature differential between the balancing drum chamber and the pump suction flow. Theoretically at least, this should be good. However, the scheme is not good when the drum leakage is piped back to pump suction, and any thermally controlled system has some inherent sluggishness.

4. How to Install Feed Pump Warm-Up Lines

WHY is it necessary to have a feed pump warmed up before starting?

In the first place, if hot water is sucked into a cold pump, the thinner metal sections will heat up faster than the heavy sections. This means that the impellers will expand almost immediately, whereas the heavier stationary parts will lag behind. The result is a temporary reduction in the operating clearances through the pump, and for a 300 F differential this can amount to the total nominal running clearance. This problem is aggravated by the reduction of running clearances caused by deposition of iron oxide.

The second possibility to worry about is that the pump will be unevenly heated; for example, warm on the top and cold on the bottom. This is likely to happen when a pump has been recently taken off the line. A pump that is hot on the top and cold on the bottom is actually arched or bowed, and this means that the rotor is rubbing somewhere along the series of running fits.

The best all 'round warm-up scheme consists of a small jumper line around the discharge and check valves on the pump. If the jumper line is fitted with an orifice and left open, the set-up is automatic. As soon as the pump is shut down, the main check valve closes and water from the feed header flows through the jumper, back through the pump and up the suction line.

The quantity of warm-up water is difficult to calculate. We do know a few factors that influence the amount required. The higher the temperature of the hot pump, the more radiation, and consequently there must be more Btu's to keep it hot. An uninsulated pump will require more than an insulated pump of the same size. A big pump naturally takes more than a small one. Ten gpm is a fair figure to maintain a 1200 gpm barrel pump at 100 F under operating temperature. Field adjustment of quantity may be required at times.

Pumps having labyrinth leakoffs in the stuffing boxes will probably not need a jumper line. As the leakoffs will be continuously draining both ends of the pump, the makeup inflow from the pump suction will take care of the heating. We got fooled once, though. All the water for the discharge end labyrinth was bypassing the pump through the balancing drum line, and it was necessary to put reverse check valves in the balance pipe going to suction.

High temperature pumps having cold condensate injection at the stuffing boxes present a warm-up problem because some of the cold condensate flows inward to the pump interior. To overcome this effect, additional warm-up line capacity may be required. ≠

Question of the Month

What's the Best Way to File Technical Articles and Data?

THE QUESTION, *What's the Best Way to File Technical Articles and Data?*, published previously in HPAC, is repeated here along with answers that have been received from several readers. Other comments and answers to the question will also be welcome.

Information on this subject previously published in HPAC may be found in the November 1947, July 1950, and September 1951 issues.

"I know this question has been asked before as HPAC's Question of the Month, and I have read answers to it which have been helpful. I have used some of the ideas, but I still haven't found the system to answer all my needs.

"What I would like to know is the best way of filing, in a small engineering office, technical information from articles in HPAC and other magazines; data from manufacturers of equipment used in heating, piping, and air conditioning work; and ideas and data from other sources.

"By 'the best way of filing,' I mean the method that takes the least time and trouble not only to put the data in the right place originally but to find it when it's wanted."—G.W.

3 x 5 Card Index Is Key to Four Filing Systems Reader Is Setting Up

I WILL ATTEMPT to outline the filing system I am in the process of working out for my professional files. At present the system is not in operation, although I am trying to use my spare time to set it up. I believe it to be the most versatile and useful filing system for which a person does not require a degree in Library Science to manage and utilize, and which can be filed by one person and used by another.

The key to the whole system is a 3 x 5 card index, with a simple alphabetical index and titles and subtitles in abundance. Four separate filing systems are used with this key:

1. A book shelf for all hard bound books, in which each chapter is numbered consecutively and word titles defining the information contained in each chapter is entered at the beginning of each chapter. The assigned number of the chapter is then transcribed in the appropriate column on 3 x 5 cards bearing those word titles. All 3 x 5 cards indexing books are pink in color.

2. A book shelf for all paper bound reprints, pamphlets, manufacturers' handbooks, etc., in which each chapter, article, or subdivision is numbered consecutively and indexed in the same manner on blue 3 x 5 cards. The books are marked on the outside with the number assigned to the first and last chapter and arranged in numerical order.

3. An equipment file for manufacturers' brochures and informative literature, price lists, etc., where each piece of literature is numbered and filed numerically and indexed on yellow 3 x 5 cards.

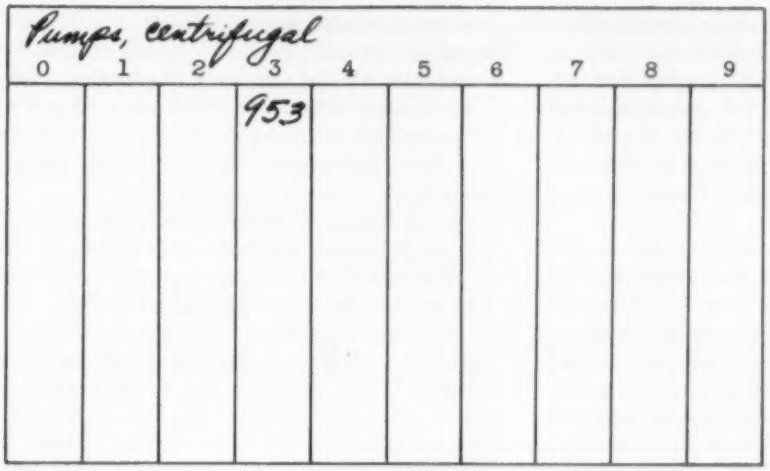
4. A literature file, in which all articles clipped from magazines or single unbound reprints are filed numerically with assigned numbers and indexed on white 3 x 5 cards.

All 3 x 5 indexes are arranged together so that under the heading, "Costs (operational)," there would be a white, blue, yellow, and pink card together, each having this heading. Location of articles as illustrated later is always accomplished by comparing index cards of the same colors. By using this color system, one can index his library and files at different times and still maintain consecutive numbering in each section to be cross referenced. He can also spot a missing book or article readily because he knows that his numerical system is consecutive in each file and does not skip from one to the other.

An example of the filing procedure and a facsimile of a 3 x 5 card is shown in the accompanying sketch.

This system is a modification of the "Uniterm" system of "Documentation Incorporated" of Dr. Mortimer Tabue, as described in Engineering News Record, May 20, 1954.

Take, for example, the procedure of filing an article on centrifugal pumps. The article gives information on costs, maintenance, equipment operation, pipe line, and mixing by use of a centrifugal pump, comparing initial and operational cost of this method with that involving the use of an agitator and surge tank.



INDEX CARDS — as many as desired for each article, book, etc. — are marked and filed alphabetically according to the subject discussed. On each card — regardless of how many cards are cross-indexed for the same article — is written the number which has been assigned to the article. The single 3 x 5 index card file containing white, blue, yellow, and pink cards is the key to four separate filing systems for (1) books; (2) pamphlets; (3) manufacturers' literature; and (4) articles. The materials themselves are filed numerically

As the article is clipped from the magazine, it is given a numerical number and the following words are written at the top: (1) Pumps (centrifugal); (2) Maintenance (equipment); (3) Economics (process); (4) Equipment Selection; (5) Costs (operational); (6) Costs (purchase); (7) Costs (installation); (8) Operation (equipment); Pipe Line Mixing; (10) Agitators; (11) Mixing.

The number assigned to the article is then entered on 3 x 5 cards bearing these headings and of the appropriate color to denote whether information is in a book—pink cards—or the literature file—white cards—or the equipment file—yellow cards—or the reprint, manufacturers' booklet, and magazine file—blue cards. The number is entered in the column corresponding to the last figure in the assigned article number.

If the article referred to above is No. 953, the entry on one 3 x 5 card would appear as shown in Fig. 1. Books are numbered by giving each chapter a consecutive number and marking the outside Nos. 103-146 for a 43 chapter book, for example.

If it becomes necessary to look up an article dealing with operational costs of centrifugal pumps, I pull the 3 x 5 cards marked "Costs (operational)" and "Pumps (centrifugal)." Any number which appears on both cards has data on the desired subject.

If reference is desired to an article comparing the costs of agitation in a surge tank vs. pipe line mixing in a centrifugal pump: pull the cards headed "Mixing (pipe line)," "Agitators," "Costs (operational)," and "Cost Comparisons." Any number appearing on all of these cards will pinpoint the article.

In practice, as long as the titles on the cards are specific enough, there is little trouble in locating a particular article, no matter where it is filed. I always use the same color cards for comparison, as the numbers will not correspond between cards of different colors. Each heading may have one card of each color, if I have reference literature in books, tear sheets, manufacturers' literature, and reprints on the same subject. Cross referencing is easy, filing simple, and pinpointing of specific articles desired is merely dependent upon the number of 3 x 5 headings used for comparison.

The use of different colored cards for the four different files simplifies the finding of the literature and aids numerical comparisons to locate a selected article. Also, division of the 3 x 5 cards in 10 columns designating the last digit in the number, simplifies the location of the same number on several cards.

Pulling two cards locates a general type of article; three gives a specific kind of information; and the selection of four or more cards usually allows a specific single article to be located.

The numbers will appear in the columns in numerically ascending order if filing is done as numbers are assigned. This also simplifies location of identical numbers on different 3 x 5 index cards.

R. H. Cushing
Chemical Engineer
Bristol Laboratories, Inc.

Files Articles, Bulletins in Binders and Fiber Pockets; Discards Obsolete Data

Since size of the office, scope of work, and reading habits vary, any suggestions that may be offered usually need to be modified to suit the specific requirements of each application.

I file magazine and technical journal articles in binders. Each binder has a typed label listing the subject matter contained therein. Typical examples are: hot water heating, evaporative cooling, refrigeration, etc., with a separate binder for each subject. To provide a suitable index, a card system is used listing title, author, magazine source, and date of publication for each subject.

Manufacturer's data sheets, bulletins, and thin paper covered catalogs are kept in fiber pockets, also having typed labels for indentification of subject matter. Typical are: unit heaters, fans, convertors, pumps, etc., with a separate pocket for each equipment category. Large cata-

logs and hard covered publications have a number and letter stenciled on the outside of each catalog cover for indexing. For example: Bates Corp. catalog has B-1, Brown Co. B-2, Burroughs Corp. B-3, James Manufacturing Co. J-1, Johnson Associates J-12, etc. A card system is also used for these publications. This index includes name of manufacturer, catalog number, date of publication, and file number.

Experience has shown throughout the period of time these methods have been employed, data sought after has been obtained with a minimum of effort. It is important to discard old copies of literature as revised or new editions are received, otherwise the files become burdened with much obsolete data wasting valuable space. In addition, failure to dispose of outdated periodicals may lead to difficulties resulting from not having up-to-date information.

H. B. WAYNE
Consulting Engineer

Keeps Commercial, Engineering Separate; Uses 144 Shelf Cabinet

THE VALUE of a good reference system which can bring forth data instantly is real to those for whom time is money. Therefore, one should invest some money in the physical portion of such a set-up and also a little time in keeping it growing.

Aside from the conventional library of books, the ideal filing system should have two parts, namely the commercial file and the engineering file.

The commercial file, of course, will consist mainly of manufacturers' equipment catalogs. These are important since any sort of a design largely is limited to available equipment. Moreover, such publications in many cases contain useful technical information pertaining to the subject matter.

These catalogs may be filed in a regular drawer type file case in alphabetical order as is done by most architects in accordance with the filing system adopted by the American Institute of Architects. However, I find that the mining operation involved in extracting information from such a file is distracting and interferes with creative thought. I like to contemplate 20 different things at once; consider, reject, and choose and perhaps get entirely new ideas quickly. This can't be done while pushing drawers and piling up stuff.

Therefore, I am using quite another type of file. For my limited purposes this file contains, in two sections, 144 shelf compartments 10 in. wide, 3 in. high and 15 in. deep, thus accommodating even a legal size file folder. All catalogs and publications lie flat and are identified as to subject on a paper strip which pushes into a slot on each shelf. For example: "Package Power Boilers." "Motorized Valves and Solenoids." "Traps." "Bearings." "Belts." "Transmissions." "Heat Pumps."

One can build such a file himself, of course. However, I recommend buying ready made steel files. I had a 15 in. high cabinet base built which is very useful for storing test equipment, large blueprints, and the like. Additional storage space on top of the file accommodates the engineering file and a series of ring binders. I use a substantial binder with metal hinges and a large tab holder at the back. It has heavy clothbound covers. At the present time, I have about 40 of them, which make about a 5½ ft row.

One does not need these binders immediately, however. In the beginning the material eventually to be filed in them can be put into the commercial file under the appropriate titles, using plain paper folders.

Then, after buying the first dozen or so binders, their titles can be held to general terms such as "Warm Air Systems." Thereafter, when such a binder begins to swell, the material can be divided into various binders, classified as: "Domestic Warm Air Systems." "High Velocity Warm Air Systems." "Floor Duct Systems." "Humidity Control." "Odors." "Condensation." etc.

Having to pull staples and filing important articles is, of course, a nuisance. But a busy man can mark the articles he desires to preserve on the publication's front cover, pencilling the binder's title in which they are to be filed on the first page, and then have an assistant do the rest. In this connection, I am grateful to any editor who keeps an article together on consecutive pages, though there may be an ad here and there.

A file of this type is a constant inspiration. Via this medium, top men in the field come to my office any time I care to ask them, and they spare no effort in giving one the benefit of their knowledge and experience. At times, however, when consulting such a binder, one may fall victim to the same diversion as when looking into a dictionary—being lured astray by all kinds of interesting things having nothing to do with the problem at hand.

WALTER OTTO
President
W. Otto Bros. Maintenance Co.
Mechanical Contractors

Files Folders Alphabetically in Cabinet, Just as Correspondence

MY PLAN which has been very satisfactory for years, is to keep regular folders in a file cabinet just as correspondence is filed.

Each folder has an appropriate heading by subjects, and these folders are filed alphabetically.

It is very easy to pull out a folder on any subject and look over all the accumulated data.

LEE P. HYNES
Consulting Engineer

Files Articles, Etc. in Numerical Order; Alphabetizes Index Cards by Catchwords

TO COLLECT technical information and data is today almost a necessity for an engineer who is interested in development. Therefore, this question is of special importance.

I knew an engineer who would rather throw away a

worthwhile article when it did not fit into his system than to extend or change the system. On the other hand, there are people who collect heaps of records without ever finding just what they are looking for.

There are filing systems which arrange the different groups in numbers, such as the decimal system which is also used in Germany. But such systems have essential drawbacks. It may, for instance, happen that the same item can be filed under several numbers and also looked for under several numbers. On the other hand, it is so large, that this system cannot be administered along with other work, but needs special employees. There are similar systems somewhat smaller but usually not extendable, so that difficulties arise with this.

The following is the system I use.

Technical information in form of photocopies, prints, handwritten notices, original essays, etc. are numbered and put into files just as they come without regard for the matter they deal with. For each item, which has a number, there is at least one index card with a catchword that deals with the interesting part of the contents. Index cards are filed alphabetically for these catchwords. It may happen that for the same article several catchwords are interesting, so several cards have to be filled in. This notation costs little time.

The files which are filed, get either numbers or letters on their backs. Thus, you can have only a few files, or as many as desired. The course of the files is the same as the timely course of the collected material. The cards are systematical and may be altered or extended at any time new catchwords come up. The alphabetical order for the cards has proved to work the best.

Instead of using catchwords from groups, the cards may be registered according to the names of the writers of essays, etc. Also, both ways may be united in one system.

Another advantage of the card and folder system is that in the card index file other cards—with no reference numbers to folders—may also be filed, containing a short remark, an excerpt, or other useful information. These cards are interfiled with the rest alphabetically by their catchwords.

This system can be administered without much time and help. With the alphabetical card index file, it is always possible to find the wanted catchword and the desired information.

K. Bach
Lahmeyer-Etna GMBH
Frankfurt Am Main
Germany ≠

For the new question turn to page 118.

Window Air Conditioners Aid Quality Control In Photo Lab

. . . production, quality increase

PHOTO LAB increased production and improved quality as a result of even temperatures and dust free air provided by air conditioning

Window type air conditioners installed in the photo printing laboratories of Commercial Photos, Inc., Dayton, Ohio, have increased production and quality, according to the Airtemp Div. of Chrysler Corp.

While the firm's prime concern was employee comfort, Elwood Heister, president of the company, reports that air conditioning "materially aids quality control, something that could not be said of the other air blowing devices we have used in the past. Negatives are kept dust free, and processing chemicals are maintained at an even temperature. These two benefits make it possible for us, in far less time than before, to turn out more prints and finer prints that are always uniform in quality."

He adds, "The exhaust feature of our room air conditioners is also quite helpful, as it removes from the laboratories the odors of various chemicals used in photo processing." ≠

Sam Lewis' Page

Cures for Comfort Disagree

AN ENGINEER whom we will call "A" and another practitioner that we will call "B" recently gave opposing prescriptions for correcting the heating and partial air conditioning of an old but well located skyscraper, whose tenants are victims of designer "A."

When "B" saw the patient, stories No. 2 and No. 3 received refrigerated cooling by overhead ducts from chilled water sprays. The chilled water came from a refrigeration compressor in the basement.

The ducts of stories No. 2 and No. 3 were far too small. The steam radiator valves were controlled manually, and exhaust fans were absent. Engineer "B" proposed to replace the sprays with cold water convectors and to install automatic temperature control, and to increase the steam pressure so that the heating convectors would not persist in freezing.

Engineer "B" found stories Nos. 10 to 18 arranged to receive refrigerated cooling by overhead ducts from chilled water convectors served by a separate compressor in the basement. The hydrostatic head on this chilled water line was 140 lb. The air ducts also were too small, there were no exhaust fans, and the tenant must open or close the steam valves on the 80 radiators on each story.

The illumination on one story was incandescent, while that on the next one was fluorescent. The prescription by "B" was to install automatic temperature control of the direct radiator valves. He also ordered an exhaust fan to coordinate with each air supply fan. He proposed to control the temperature of the air delivered by the ventilating ducts for various zones of each story. This procedure required adding a steam convector in the discharge duct of each supply fan, and making arrangements so that each orientation zone and each important room could receive air at an acceptable temperature the year 'round.

The valve on a steam preheating coil near the outside air intake on each story had been dictated by engineer "A" for control by a thermostat placed out of doors. This thermostat, being out of doors, could not sense the temperature indoors. Due to the fact that steam intended to serve the preheating coil was not dependably available, these coils did freeze and the tenants did receive outdoor air at high velocity, at outdoor temperature.

The plant for one story of this building was remodeled to suit "B" with the obvious faults corrected.

The owner was told by "A":

1) "The corrected air conditioning of the single story is installed. It cost $6000. It satisfied the tenant of that space."

2) "A" said, "Hereafter any questions about the air conditioning must be cared for by the operating engineer and not referred to an outside consultant, such as 'B.' "

3) "A" said, "Connect the refrigerating system for the lower story chilled water sprays to that for the one that must have 140 lb. Thus, either one may serve the entire building during mild weather."

Comment by "B": "You just try to make a spray type cooling system near the bottom of a tall building, keep from taking all the 140 lb chilled water from the convector systems of the upper stories."

4) "A" said, "Install on the chilled water supply to the convector on each story, a thermostatically controlled three-way water mixing valve, so that if story No. 15 is too cool — having fluorescent lights — the chilled water to that convector will be reduced in temperature, while the chilled water to story No. 16 — having incandescent lights — can be as cold as possible. This valve arrangement will cost over $500."

Comment by "B": "No adequate control of cooling or relative humidity can be achieved in hot weather with convector surfaces warmer than dew point temperature. Control can be achieved by warming the too cool air or by bypassing part of it around the cold surfaces.

5) "A" asked, "Why did 'B' remove the pretempering coil on the single story?"

Comment by "B": "This coil could not control the conditions within the rooms of that story. It was frozen annually, and as arranged, was useless. If it could get steam — which it could not — the heated air would be too warm for the east orientation, but too cool for the west orientation on any morning."

6) "A" said, "The rearrangement and correction of the story done by 'B's' prescription did cost $6000. 'B's' ideas should not be followed."

7) "A" said, "I would *not* adopt the recommendation of 'B' that the condensate from the fuel oil heaters be wasted rather than returned to the boilers. 'B' said that this would reduce the chance of getting oil in the boilers or water in the fuel oil. I would take that chance rather than lose the heat in the condensate."

8) The reader may deduce that Sam Lewis agrees with "B." ≠

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

How to Test Fan Systems in the Field

By C. Jack Trickler

Chief Engineer
The New York Blower Co.

FREQUENTLY it is desirable to field test a fan to study the system for future design purposes or to correct the speed to give a desired capacity. Naturally, those testing in the field cannot expect to achieve laboratory accuracy. In a statement based on holding test accuracy to exact tolerances, the National Association of Fan Manufacturers says, "No accurate or practical method of testing fans in the field has thus far been developed by means of gas analysis or by use of the Pitot tube."

Nevertheless, since field testing is often necessary, here are some of the factors involved, including the basic tools and their limitations. Following the rules suggested below—with regard for limitations and probable accuracy—should give a fair indication of system performance.

There are three principal methods of field testing, each with its own advantages and degree of accuracy.

1. Apply Correction Factor for Anemometer

An anemometer may be used to measure air flow through supply outlets. A fairly accurate device when new, it is fragile and requires frequent calibration. A correction factor must be applied, depending on the type of supply outlet or intake used. For rough approximations, the velocity reading should be multiplied by 0.85 for return air intakes and 1.03 for supply outlets. Where more accuracy is desired, the Journal and Transactions of the American Society of Heating and Ventilating Engineers for 1933, 1939, and 1940 may be consulted for specific applications.

Reliable authorities do not agree on the proper methods of using the anemometer to obtain accurate results. The anemometer should not be used as an indication of a fan's performance, as it does not indicate static pressure.

2. Velometer Is Direct Reading

The velometer is useful in testing systems where the purpose is not to establish future design conditions. On ideal systems, the velometer is accurate to 2 or 3 percent, but like the anemometer is subject to mechanical failure and needs frequent factory adjustment. It does have the advantage of being a direct reading instrument. Handled and used with care, it should suffice for most field test needs, but it must not be used on dust, acid, or material handling systems.

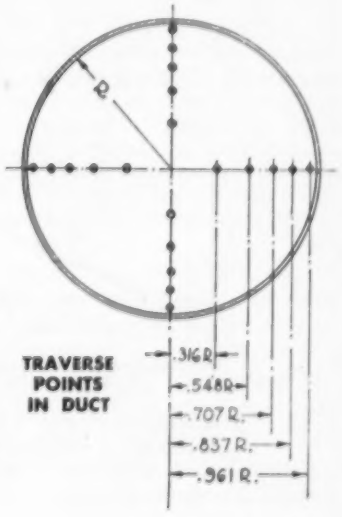
3. Pitot Tube Is Basis of Calibrating Devices

The Pitot tube is the basis of calibration for all other air measuring devices. Since it has no moving parts, it is more durable and accurate; and since no air flows through it, it may be used in any atmosphere. It never needs adjustment and is very reliable. It may be used in either of two ways:

a) When a location can be found in the system where the velocity conforms to the ideal pattern with the highest velocity near the center of the duct, only one velocity reading is necessary. This should be taken at the highest velocity. Eight-tenths of this velocity should approximate the average duct velocity, as any standard test on air flow in ducts will show. The accuracy of this test will be about the same as with a velometer.

This correction also applies to anemometers and velometers where only one location is read.

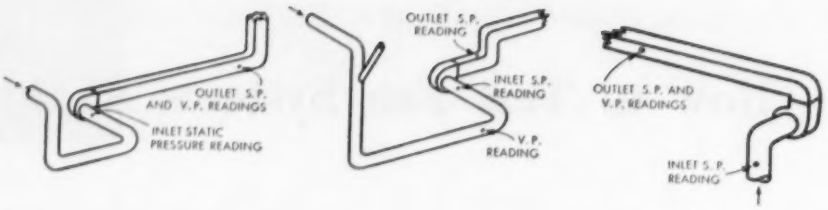
b) Where maximum accuracy is desired, the field test should come as close as possible to a laboratory test. The average velocity should be obtained by the method outlined in the NAFM test code. This consists of dividing a round duct into bands of equal area and taking readings at the mean radius of each band, as shown in Fig. 1. Rectangular ducts are divided into 16 equal areas, and a reading is taken at the center of each.



1 TRAVERSE POINTS are selected by dividing round duct into bands of equal area and taking readings at the mean radius of each band

Tear out along this line

HPAC DATA SHEET



2 BEST POINTS for test readings are indicated for the three field conditions shown. If a straight length of duct several diameters long can be found, readings should be taken toward the downstream end

Always be sure that the Pitot tube points directly into the air stream. A convenient way to locate the tube inside the duct is to wrap it with tape and mark the distance to be inserted on the tape. Two holes at 90 deg are required for a round duct and four holes on one side for a rectangular duct. Many velocity readings may be required, but only enough static pressure readings are needed to assure that the static pressure is constant. If it is not, choose another location.

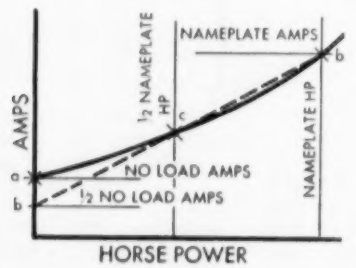
Follow These Steps for Best Results

Best test results will be obtained if these steps are followed:

1) A sketch of the system should be made for the record and as a guide for selecting points for readings. Very often this will bring to notice poor design features.

2) The installation should be examined with an eye to certain construction features. Laboratory test installations are designed to give smooth air flow to and from the fan. Inlet and outlet ducts are of the same areas as the fan inlets and outlets, respectively, and extend straight for 10 diameters from the fans. Both inlet and outlet ducts have straighteners before the points of readings. This setup avoids turbulence. Nothing distorts readings as much as excessively turbulent air flow.

Such an installation is seldom met in actual practice. But the greater the deviation, the greater the error to be expected. Above all, fans with any but a straight inlet connection should be carefully considered, as discussed in HPAC's April Data Sheet, *How to Design Good Fan Inlet Connections*. Fan performance may be down considerably through no fault of its own. No single factor can destroy a fan's efficiency more subtly than a poor inlet connection.



3 HORSEPOWER INPUT can be found, approximately, by plotting a rough horsepower vs. amps curve — solid line a, c, b — for the fan motor

3) For any test but that employing an anemometer, velocity and static pressure readings are necessary. In the laboratory they are taken at well defined points, but actual installations usually make these points awkward. If a straight length of duct several diameters long can be found, the readings should be taken toward the downstream end: the end nearest the fan on the inlet side and farthest from the fan on the outlet side. Three field conditions and the best points for test readings are shown in Fig. 2.

4) When determining why a particular fan is not performing as it should, four temperature readings should be made about the fan inlet. It may be necessary to drill four holes in the duct to obtain the temperatures. If more than 2 F variation is found, the air is entering stratified, and the effect can easily be similar to that of a poor elbow on the inlet. Be sure to locate the cause of the stratification and remove it.

5) A convenient method of finding the approximate horsepower input is to plot a rough horsepower vs. amps curve for the motor—Fig. 3—as follows:

a) Establish no-load amps by running disconnected from fan, point *a*.

b) Draw dotted line through one-half no-load amps at zero hp and nameplate amps at nameplate hp, points *bb*.

c) At one-half nameplate hp, mark a point, *c*, on this line.

d) Draw a smooth solid curve through these three points, *a*, *c*, *b*.

e) Determine running hp by plotting running amps.

6) Where test results are compared to catalog ratings, the observed data must be converted to standard density. Three readings establish the density:

a) Barometric pressure may be obtained from the local weather bureau. Obtain the actual pressure and not the pressure corrected to sea level. Correct any reading to your elevation if the barometer is at a different altitude.

b) The wet and dry bulb temperatures should be taken in the air stream.

c) Plate XVI of the NAFM test code gives the air density in table form. ⋕

HEATING, PIPING & AIR CONDITIONING
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Journal Section

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Pulsations in Residential Heating Equipment

Preliminary Results

By A. A. Putnam* and W. R. Dennis**, Columbus, Ohio

This paper is the result of research sponsored jointly by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, the *American Gas Association* and the Oil Heat Institute of America, Inc., conducted through Battelle Memorial Institute.

SUMMARY: Progress of an investigation of pulsations in oil-fired and gas-fired heating equipment is described. The research program has the objectives of defining the fundamental nature of the pulsations and of finding methods for their suppression or complete elimination. In an initial field survey, it was found that each unit tested generated standing waves of a type similar to those produced in a double-necked resonator. Conventional furnaces were then studied briefly in the laboratory, and the results obtained were applied to the design of 2 experimental furnaces.

Two experimental techniques have been used: (1) motion-picture studies, and (2) tests in which important factors, such as air-fuel ratio, are varied, and their effect on oscillations noted. From the preliminary results presented in this report, the following can be stated: (1) For the oil-fired unit, the important factors in oscillations appear to be: (*a*) the relative flow patterns of fresh air, hot products of combustion, and fuel, and (*b*) the relative positions of the combustion zone and the pressure antinode. (2) For the gas-fired unit, the most important variable appears to be the rate of flow of primary air. (3) Motion-picture studies indicate that the mechanisms for driving of oscillations are related to periodic, rapid flame expansions for the oil-fired unit, and a vortex shedding, for the gas-fired unit.

PULSATIONS have been one of the most annoying problems facing the manufacturer and the distributor of residential heating equipment. A furnace or boiler which *goes into pulsation* will be noisy enough to be heard or felt throughout the dwelling, and sometimes may even cause damage to the house or its contents. Service calls to correct the condition can represent a considerable expense to the organization responsible for satisfactory equipment performance.

To eliminate pulsations, one or more components of the combustion system usually are modified by trial and error until a cure is effected. The modifications may be effective permanently in some installations, and may afford only temporary relief in others. Frequently, the same modifications will not suppress pulsations

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in other installations apparently similar to the first. Such experiences occur because an understanding of the exact nature and mechanism of the pulsations is lacking.

A research project was activated at Battelle Memorial Institute in May,

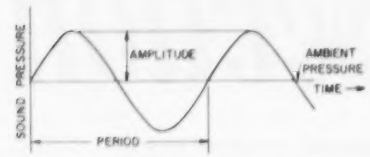


Fig. 1 — Sinusoidal variation of pressure with time

1954 to (1) determine the nature of pulsations in oil- and gas-fired residential furnaces and boilers, and (2) find methods for suppressing pulsations. The project is guided by the Pulsations Research Subcommittee of the Technical Advisory Committee on Combustion of the ASHAE.

The chief purposes of the present paper are (1) to discuss theoretical and experimental methods being used to investigate the fundamental nature of pulsations, and (2) to give an account of the general test results to date. This paper should be considered as a progress report in which are discussed the objectives already attained and the goals still to be reached.

Acoustical Theory

Before discussing theoretical considerations and results of tests, certain acoustical terms are defined and certain aspects of standing-wave theory are discussed.

Figs. 1 and 2 show the sinusoidal variation of pressure with time and with position in an open organ pipe, or half-wave tube. Terms which may

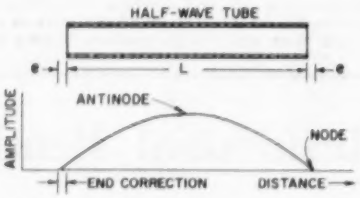


Fig. 2 — Standing wave in an open organ pipe (half-wave tube)

be clarified by illustrations are denoted on the figures and the Terminology section describes and defines various words and terms used.

Standing Waves: It will be shown later that the oscillations in residential heating equipment studied thus far are of the standing-wave type with one pressure antinode. A brief discussion of standing waves in 4 types of simple systems follows:

The first system to be considered is the open organ pipe, or half-wave tube of Fig. 2. A standing pressure wave in the half-wave tube can be pictured as follows: Periodically, air flows inwardly from the ends, building up a higher pressure region at the center. As the pressure increases,

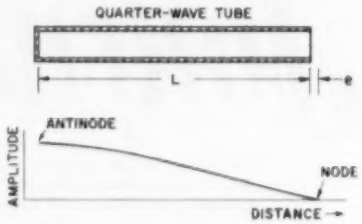


Fig. 3 — Standing wave in a closed organ pipe (quarter-wave tube)

the inflow of air slows down and finally stops. The higher pressure at the center then causes a reversal of flow outwardly toward both ends, accompanied by a lowering of pressure at the center. Because of the momentum of the air, the pressure at the center eventually falls below ambient pressure and with the build-up of this partial vacuum, the outflow of air finally decreases to zero. Then, the gas starts to rush into the partial vacuum and the cycle repeats.

Terminology

1. Oscillation — periodic variation, with time, of pressure with respect to the ambient pressure. During oscillation, the pressure is alternately greater than and less than the ambient pressure.

2. Pulsation — here considered to be the observable effects of the pressure oscillations. That is, pulsations can be seen, felt, or heard by an observer, or measured as changes in pressure of the surrounding atmosphere or as forces exerted on surrounding surfaces. Since there are certain physiological implications connected with the term *pulsation*, the term *oscillation* is used in the subsequent discussion.

3. Cycle — complete sequence of values of pressure; at the end of a cycle, the pressure and the rate of change of pressure together repeat themselves. Note that the pressure assumes the same value at 2 times during a cycle, unless the cycle is taken from one time of maximum or minimum pressure to the next.

4. Period — time interval consumed by one cycle.

5. Frequency — number of periods occurring in one second, or number of cycles per second (cps).

6. Amplitude — absolute value of the maximum difference between the instantaneous static pressure and the ambient pressure in a given period.

7. Phase — fractional part of a period through which the independent variable, usually time, has advanced, measured from an arbitrary origin. The origin is usually chosen so that the fraction is less than unity.

8. Wavelength — distance between 2 wave fronts in which the pressures have a difference in phase of one complete period. During one period, the wave has advanced a distance equal to the product of the velocity of sound and the period.

9. Standing Wave — oscillations having a fixed distribution of amplitudes in space, and characterized by the existence of nodes and antinodes that are fixed in space.

10. Nodes — points, lines, or surfaces in a standing wave where there is zero amplitude.

11. Antinodes — points, lines, or surfaces in a standing wave where there is maximum amplitude.

12. End Correction — length added to an oscillating gaseous system to account for the fact that the pressure node at an open end is located somewhat beyond the physical end of the system. The size of the correction depends upon the configuration of the opening. For a cylindrical pipe, the correction is usually taken as 0.6 of the radius.

The period, or time for one cycle of pressure variation, is

$$t' = 2(L + 2e)/c = a/c \quad \ldots\ldots(1)$$

where

e = end correction.

c = velocity of sound.

a = wavelength. The length of the tube plus 2 end corrections, $L + 2e$, is equal to $a/2$, so that it is termed a half-wave tube.

Fig. 3 shows the standing pressure wave in a pipe with one end closed.

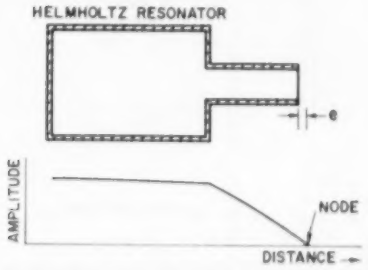


Fig. 4 — Standing wave in a Helmholtz resonator

The pressure distribution and the gas motion are the same as for one half of the half-wave tube of Fig. 2. In other words, the half-wave tube could be divided into 2 quarter-wave tubes by a centrally located wall.

Fig. 4 shows the standing wave in a cylindrical Helmholtz resonator, which is obtained by enlarging the closed end of the quarter-wave tube. This portion becomes the body, and the open end becomes the neck. If the diameter of the neck is small compared to the diameter of the body, the pressure variation is nearly uniform and at a high amplitude throughout the body, and decreases rapidly along the neck. The gases in the neck act as a mass; those in the body act as a spring. As the neck diameter is increased, the standing wave in the system becomes similar to the standing wave in a quarter-wave tube.

Fig. 5 shows the standing wave in a cylindrical Helmholtz resonator having 2 necks. As the diameters of the necks are increased, the standing wave in the system becomes similar to that in a half-wave tube.

General Plan of Research Program

There are several possible mechanisms for generating oscillations in a combustion system. These include: (1) periodic upstream movement of pressure pulses into the supply lines of the burner which may cause periodic changes in the rate of flow of fuel, of air, or of combustible mixture; (2) periodic changes in flame shape; (3) periodic changes in the rate of mass flow into a flame, not associated with upstream movement of pressure pulses; and (4) changes in pressure, which may cause periodic changes in mass burning rate. Each of these mechanisms may cause periodic changes in the rate of heat release, from which energy becomes available to drive oscillations.

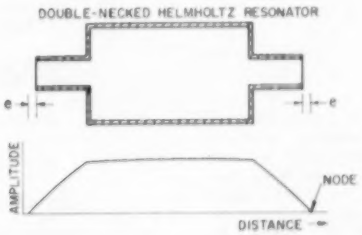


Fig. 5 — Standing wave in a double-necked Helmholtz resonator

Each of the mechanisms just listed is usually acoustical in nature, so that acoustic standing or traveling waves are established. Other possible mechanisms should be mentioned which are not acoustical in nature. The flame may amplify pressure oscillations traveling into the combustion zone from such sources as an air blower or even random disturbances in the atmosphere. Oscillations may also arise from disturbances inherent in either the flow pattern or the recirculation pattern within the combustion space.

One factor is common to all these mechanisms. In every instance of a flame-driven oscillation, there must be a greater rate of heat release during the part of each cycle when the pressure is above average than during the part when the pressure is below average. Also, the source of driving energy, or the flame, must be near a pressure antinode.

The oscillations which are driven within particular combustion systems can be divided into 3 broad categories: (1) acoustic standing waves, (2) acoustic traveling waves, and

(3) nonacoustic pulses. The first phase of the work was to determine which type was being generated in standard residential heating equipment. The next step was to test 2 conventional furnaces, one gas- and one oil-fired, in the laboratory. In

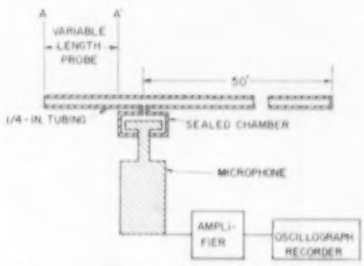


Fig. 6 — Sketch of microphone probe and associated equipment

these tests, information as to the mechanism of driving was sought. However, it soon became apparent that the numerous variables involved could not be controlled to a degree sufficient for obtaining accurate data. Therefore, information obtained from tests on the conventional furnaces was used to design 2 experimental furnaces, one gas- and one oil-fired, in which the variables of interest could be more closely controlled. The research is now concerned with these experimental furnaces.

The final phase of the investigation, not yet initiated, will be concerned with devising methods for suppressing the undesirable oscillations. Pertinent fundamental information obtained in the previous phases as to the nature of the oscillations will be applied. In this way, the final objectives can be approached, namely, (1) to furnish service men with means for eliminating oscillations which are consistent with the phenomena which cause them, and (2) to furnish manufacturers with information on which to base designs of oscillation-free equipment.

In the first phase of the investigation, troublesome oscillations were studied in equipment already in oper-

ation. Twenty-one units were tested. 10 gas-fired warm-air furnaces, 5 oil-fired warm-air furnaces, and 6 oil-fired boilers. The principal type of test was to probe the unit to determine pressure amplitudes and phase changes along the path of gas travel.

Fig. 6 shows the microphone probe and associated equipment used to measure pressure amplitude. The probe itself is the section from A to A′, which could be inserted through a 1/4-in. hole to any desired point in the system. Interference from reflected pulses was avoided by allowing the pressure waves to pass through 50 ft of tubing, wherein most of the energy was dissipated. Using 2 probes of the same length, the amplitude at each probe position could be compared with the amplitude at a fixed position near the flame, and differences in phase at 2 points could be measured.

Fig. 7 is a sketch of a tubeless boiler which was probed in the manner just discussed. Denoted on the sketch are the amplitudes at circled Points 1 through 5 relative to the amplitude at Point 2.

Fig. 8 is a plot of relative amplitude as a function of distance along the path of gas travel for the system of Fig. 7. The curve through the data points resembles the curve shown on Fig. 5 for the standing wave in a double-necked Helmholtz resonator. Similar pressure distributions were encountered in all of the units, both gas- and oil-fired, tested in the field.

No phase changes were detected in any of the units tested in the field; this fact also indicated that each system behaved like a double-necked Helmholtz resonator. The physical ends of a unit were the blast tube and the barometric damper, for oil-fired systems, and the secondary-air inlet and draft hood, for gas-fired systems.

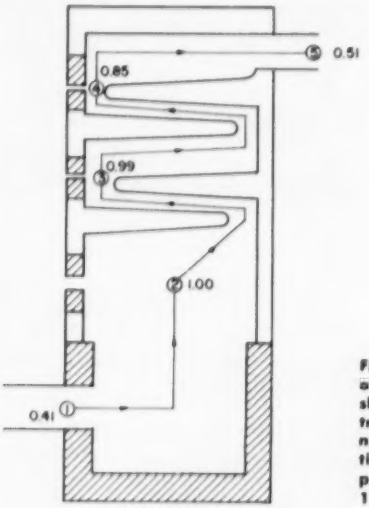


Fig. 7 (left)—Sketch of tubeless boiler, showing path of gas travel (numbers denote amplitude relative to amplitude at point 2, taken as 1.00)

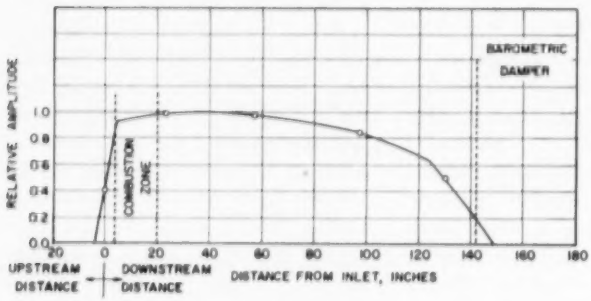
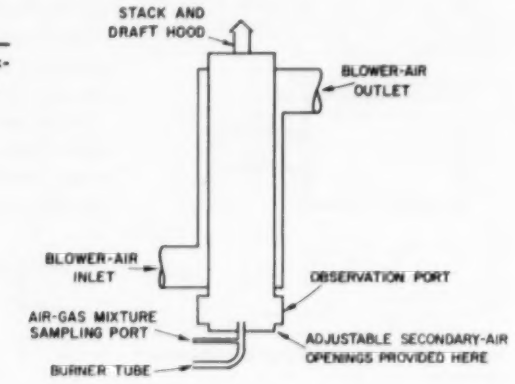
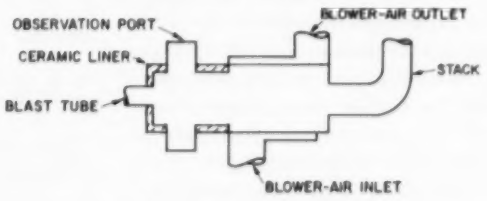


Fig. 8 — Oscillating-pressure distribution in tubeless boiler of Fig. 7

Fig. 9 (right) — Sketches of two experimental furnaces



(a) GAS-FIRED EXPERIMENTAL FURNACE



(b) OIL-FIRED EXPERIMENTAL FURNACE

It was concluded that the oscillations encountered in the field tests were exclusively of the standing-wave type. Attention was next directed to the flame itself, with the aim of determining the mechanism of energy transfer to the oscillations.

Laboratory Tests

The second phase of the investigation constituted a brief test program in the laboratory on 2 conventional furnaces, one gas- and one oil-fired. In preliminary tests, it was found that these units behaved in the same way as units tested in the field. Oscillation studies of a detailed nature were then conducted. The results of these studies determined what design features should be incorporated in the 2 experimental furnaces which were subsequently constructed and tested. For example, tests on the conventional furnaces showed that provisions must be made

for varying under close control the flow rate of combustion air in the oil-fired unit, the flow rates of both primary and secondary air in the gas-fired unit, and the fuel flow rates in both types of furnaces.

The experimental furnaces, one oil-fired and one gas-fired, were designed with 2 chief aims. One aim was to simplify the configuration downstream of the combustion zone to one amenable to acoustical analysis and control. The other aim was to increase the degree of precision with which the most important variables could be controlled and measured. Testing of these experimental units for oscillations is now in progress. After a brief discussion of the configuration of the experimental furnaces, the important results obtained thus far are summarized, and samples of the results for 2 types of tests are discussed in detail.

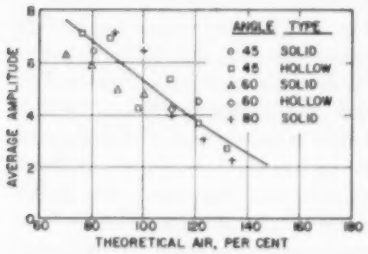


Fig. 10a — High-amplitude oscillation data for 1.0-gph nozzles, spark off

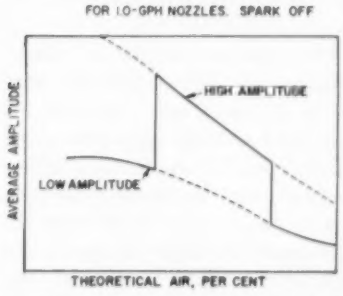


Fig. 10b — Sketch of low- and high-amplitude ranges of oscillation

Apparatus: Fig. 9, diagrams (a) and (b), shows gas-fired and oil-fired experimental furnaces, respectively. Each furnace consists of a cylindrical combustion chamber of 14 in. inside diameter, surrounded by an annular duct through which cooling air is circulated. For the gas-fired unit, the combustion chamber is the same diameter throughout, and is 60 in. long. For the oil-fired unit, the first 18 in. is lined with 2 in. of refractory, and the total length of the combustion chamber is about 40 in. Two diametrically opposite observation ports are provided near the inlet end of each furnace. For the oil-fired unit, a high-pressure gun-type burner is used, and for the gas-fired unit, an atmospheric burner of the single-port type is used.

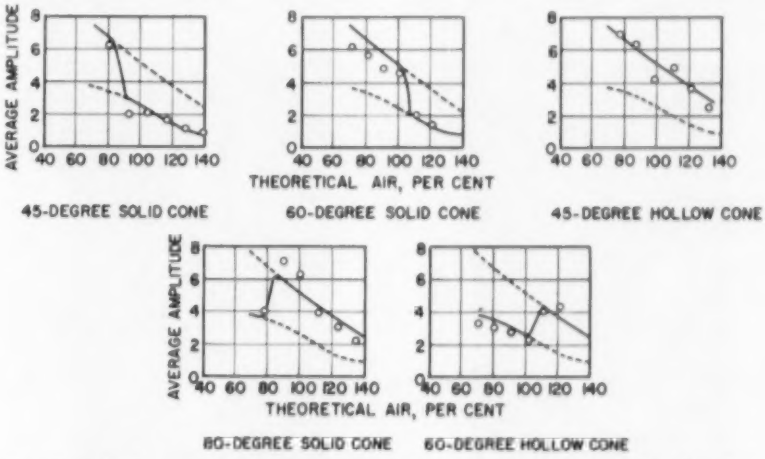


Fig. 11 — High- and low-amplitude oscillation ranges for 1.0-gph nozzles of various spray angles and spray types, spark off

Test Results on the Oil-Fired Unit: In the tests to be discussed, the air first flowed through a metering orifice of the critical-flow type, and then passed through two 1/4-in. lines to diametrically opposed points on the blower housing.

Oscillations in an oil-fired unit are vitally influenced by the interaction of 3 factors, the air-flow pattern, the fuel-spray pattern, and the pattern of recirculation of hot gases in the combustion chamber. This interaction might, under certain conditions, result in flame instability and periodic variations in rate of burning. The consequent variations in the rate of heat release would furnish the energy to drive the oscillations, and maintain the combination of interactions causing the instability of the flame. Thus, no one of these factors can be isolated and given exclusive responsibility for the promotion of oscillations.

Such an oscillation mechanism is termed autonomous, and is characterized by an oscillating energy source within the system which drives an oscillation to some finite amplitude. At this amplitude, the acoustic damping losses of the system balance the amount of energy which is available for driving. The average amplitude remains fairly constant near this value unless suppressive measures are taken.

One way to study the influence of air-flow pattern, recirculation pattern, and fuel-spray pattern was to keep constant the air-flow pattern, and to vary the fuel-spray pattern. This was done by using a number of different fuel nozzles of different capacities, spray angles, and spray types, with no change in blast-tube configuration and therefore no change in air-flow pattern. No effort was made to control the recirculation pattern, which is strongly influenced by the interior configuration of the furnace.

There were two results of particular interest, as follows.

(1) The amplitude of oscillation increased as the opening of the barometric damper was increased. Considering the furnace as a double-necked resonator, with the damper as the physical end of one neck, an increase in area of the damper open-

ing would decrease the end correction, and therefore would decrease the effective length of this neck. This, in turn, would decrease the wavelength of the system and also move the location of the cross-section of maximum pressure amplitude toward the combustion zone. Bringing the region of maximum pressure amplitude and the combustion zone closer togeather is conducive to more efficient driving of the oscillations by the combustion process.

(2) The amplitude of oscillation was considerably higher with the spark turned off than with the spark left continuously. Apparently, continuous ignition in the experimental furnace had a stabilizing effect on the flame which reduced the oscillating component of the rate of heat release.

The amplitude data for all nozzles at one setting of the barometric damper, and with spark off, plotted as a function of air-fuel ratio fell into 2 distinct classes, high amplitudes and low amplitudes. Within each class, the amplitude decreased with increase in percentage theoretical air. The high-amplitude type was loud, and would be extremely troublesome in practice. The low-amplitude type was loud at rich mixture, but decreased in intensity to that of normal flame noise as the percentage of theoretical air was increased.

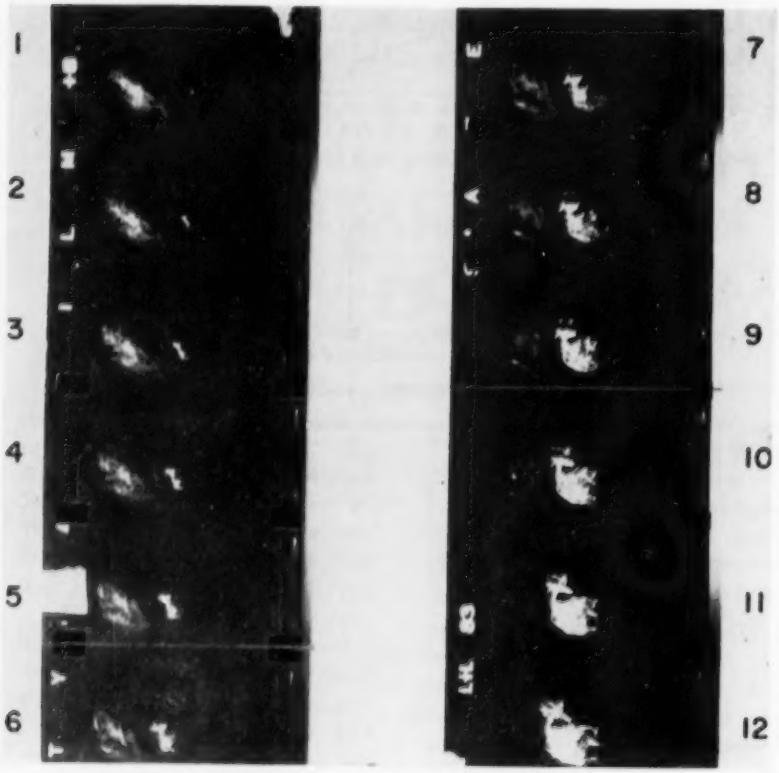


Fig. 12 — High-speed photographs of oscillating oil flame

Fig. 10*a* shows how the high amplitude curve between 70 and 140 percent theoretical air was obtained. The low-amplitude curve was obtained similarly from the low amplitude data. Fig. 10*b* is a sketch of the high- and low-amplitude curves. A typical curve through the data for a particular nozzle is indicated by the solid curve. The location of the high-amplitude section, in terms of mixture composition, varied from nozzle to nozzle. The tests were extended to a far richer mixture ratio than would be used in practice to permit the establishment and definition of such general results as are presented herein.

Fig. 11 shows how the high- and low-amplitude sections of the curves through the data shifted with change in spray angle and spray type for the 1.0-gph nozzles used. The range of mixture ratios covered was not broad enough to show the entire high-amplitude range, as drawn in Fig. 10*b*. The curves are the average curves for all the data, including nozzle capacities from 0.75 to 1.25 gph, but excluding 80- and 90-deg hollow-cone nozzles. The high- and low-amplitude curves are connected in the region between 2 data points where the oscillation changed from one type to the other. In each plot, as in Fig. 10*b*, the portions of each curve for which oscillations of that particular type were generated are shown as solid lines.

The plots are ordered as follows, reading from left to right and starting at the upper left; solid cone, 45 deg; solid cone, 60 deg; hollow cone, 45 deg; solid cone, 80 deg; hollow cone, 60 deg. The order shows consistent changes in the positions of the high- and low-amplitude ranges. The order of the nozzles in terms of their acoustical behavior was found to be the same as their order in terms of calculated effective spray angle.

For the 80- and 90-deg hollow-cone nozzles, which were omitted in the original analysis of the data, the curve for the low-amplitude oscillations was distorted somewhat on the rich side. Otherwise the results conformed to those already discussed.

The results just discussed were obtained by varying the type of spray nozzle without any change in the pattern of air flow around the nozzle. It is expected that similar results will be obtained by changing the air distribution, using a fixed spray.

Motion-picture studies have also been of value in studying oscillations in the oil-fired unit. They have been used to identify characteristics of the visible combustion process which might be related to the mechanism of driving.

Fig. 12 is a typical sequence of frames taken from high-speed motion

pictures of the flame in the experimental oil-fired furnace. The film speed was approximately 900 frames per second for these photographs. Flow is from right to left, with the fuel-spray nozzle just out of view to the right at the center of the frame. Referring to Fig. 9, the photographs were taken through the lower view port, with the upper port covered. The field of view is about 7 in. along the axis of the combustion chamber.

The distinguishing characteristic of the combustion is the extremely small *dot* of flame somewhat below the axis and near the midpoint of the first frame. This small area of flame expands rapidly from frame to frame, and has become large in Frame 12. Simultaneously, the large area of flame at the extreme left of Frame 1 rapidly moves out of view and has almost completely disappeared in Frame 12. This flame apparently was the remnant of the flame which expanded immediately before the one just described.

The flame expansion seen in the 12 frames of Fig. 12 can be considered as the beginning of one cycle of oscillation, and covers about 1/3 of a complete cycle. During the remainder of the cycle, the flame continues to cover a large area and moves downstream to the left, finally fading out as did the previous flame seen at the left of Frame 1. The expansion of a small *dot* into a large flame occurred once per cycle. This fact led to the tentative conclusion that the sudden release of energy from the rapid burning is responsible for driving the observed oscillations.

Test Results on the Gas-Fired Unit: The test results for the experimental gas-fired single-port furnace can be summarized as follows. For a given furnace configuration, the effects of (*a*) fuel-flow rate, (*b*) primary air-flow rate, and (*c*) secondary air-flow rate and distribution on generation of oscillations were studied. As the fuel flow rate was increased, the amplitude of oscillation increased. This was apparently a result of the additional energy available for driving oscillations as a rate of combustion was increased. Secondary air-flow rate and distribution have shown only a slight effect on oscillations in the experiments made thus far, and do not appear to be of primary importance.

At the present stage of the investigation, the rate of flow of primary air in a given burner configuration appears to be the most significant variable affecting generation of oscillations. In a series of tests in which the primary air-flow rate was varied, while keeping the fuel-flow rate and secondary air-flow rate constant, the phenomenon similar to that just described for the oil-fired unit was observed. This was the appearance of both a low-amplitude and a high-amplitude type of oscillation. The phenomenon differs from that of the oil-fired unit in that no changes in operating conditions were made during the time that the high-amplitude oscillations appeared. At low primary air-flow rates, no high-amplitude oscillations were generated. As the primary air-flow rate was increased, high-amplitude oscillations were generated in short bursts for increasing percentages of a fixed time interval of operation. However, at no time were high-amplitude oscillations generated exclusively.

The 2 types of gas-furnace oscillations encountered were distinguished not only by difference in amplitude,

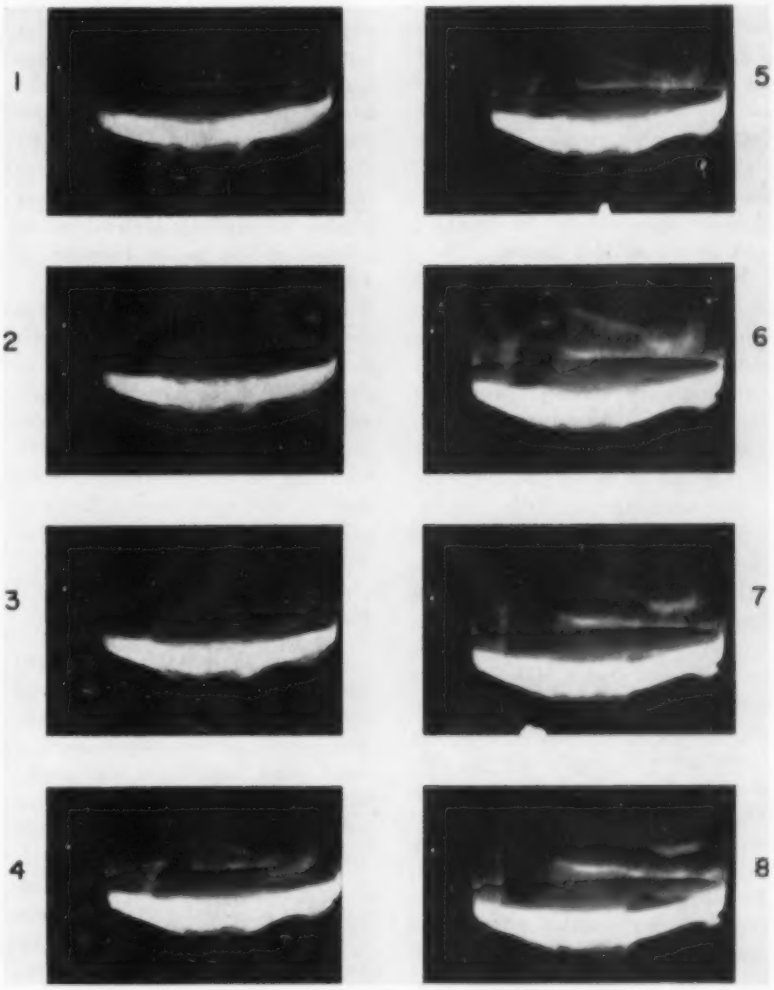


Fig. 13 — High-speed photographs of oscillating gas flame

but also by the appearance of the flame in each case. In observing the flame around a 7-in.-diameter flame spreader located at the rather close distance of 1 in. above the burner port, the flame appeared as a bluish ring about ½ in. inside the edge of the spreader when the low-amplitude oscillations were generated. This flame appeared stable. When the high-amplitude oscillations occurred, the entire under surface of the spreader appeared to be speckled with shortlived blue flames.

The dependence of the time at high amplitude on changes in the configuration of the furnace, such as changes in length of primary air duct and height of spreader above the duct, has been demonstrated. A detailed investigation of these effects is expected to show that for some conditions, high-amplitude oscillations will occur over the entire range of reasonable primary air-fuel ratios.

Fig. 13 shows a sequence of frames from a high-speed motion picture of the gas flame, colored with sodium, taken during high-amplitude oscillations, covering about one cycle of oscillation. Owing to the high frame speed of about 850 cps, only alternate frames are shown herein. The horizontal field of view was slightly greater than 7 in. wide at the axis of the combustion chamber. Flow is from bottom to top on each frame. A small portion of the flame spreader, which is intensely illuminated by the flame underneath, is cut off at the extreme left hand side of the frame.

In Frame 1 of Fig. 13, the near edge of a vortex ring resembling the well-known smoke ring, is just appearing at the top front edge of the spreader. In Frame 4, the vortex ring has risen an appreciable distance, but as a result of the viewing angle, the back edge of the ring is just coming into view, although the vortex is horizontal. In Frame 8, the entire ring, which is by now somewhat distorted and broken, is above the spreader, and is being viewed from underneath. Evidence that the vortex is originally generated at the lip of the burner tube is given by the progressive movement of a distortion up the underside of the flame surface. This distortion is quite clear on the right side beginning with Frame 2 and continuing through Frame 8.

Many examples are known of the phenomena of vortex shedding. For instance, an oscillating gas column in a tube can shed vortices from the edge of the tube. A jet of gas impinging on a wedge at the proper location will also produce vortices. Usually, neither of these phenomena reaches an amplitude high enough to produce audible sound. However, if a natural shedding time and one of the natural periods of the tube agree closely, the vortex shedding and the natural oscillation of the gases in the tube can reinforce each other, and high-amplitude oscillations may result. Such a phenomenon may be occurring in the gas furnace being studied, with an additional factor of periodic energy addition by a pulsating heat-release rate.

Future Work

The next phase of the experimental work on the oil-fired experimental furnace will cover the effects of air-flow pattern on oscillations, using a fixed spray pattern. At the conclusion of these tests, it is expected that sufficient information on the mechanism of driving will be available to permit a study of methods of eliminating or suppressing the oscillations.

Future work on the gas-fired experimental furnace will be concerned with the effects of primarly air-flow rate, primary air-fuel ratio, and burner-tube configuration on generation of high-amplitude oscillations. Motion-picture studies will be continued and model studies are planned to obtain further information on the vortex-shedding phenomenon. The flow characteristics within the burner tube are also considered of importance, and will be investigated.

Acknowledgment

The able assistance of the members of the Pulsation Research Steering Subcommittee of the TAC on Combustion of ASHAE in guiding the research and providing necessary information and materials is gratefully acknowledged. Thanks are due to the organizations and individuals, too numerous to mention, whose cooperation was essential to the successful completion of the field work. Special thanks are due to the personnel of the Armstrong Furnace Company, Columbus, Ohio, who provided the proving ground for the first stages of the field work, and who also constructed the experimental furnaces.

Pesterfield and Wilson at Oil Heat Symposium

One of the features of the 34th Annual Convention of the *Oil Heat Institute of America* was the Commercial-Industrial Symposium for architects, engineers and others interested in commercial-industrial oil burners. The Symposium was held in New York on June 13 with C. H. Pesterfield, professor of mechanical engineering at Michigan State University, as moderator and K. M. Wilson, of E. F. Klingler and Associates, Inc., Eau Claire, Wis., as one of the principal speakers. Both are members of ASHAE.

BOOK ON ENGINEERING LAW

Legal Problems in Engineering is that rarity of a book written by an engineer (and holder of a doctorate in engineering) who is also a practicing lawyer. The book is broad in scope but compact in size. The author uses legal cases to illustrate legal points rather than to confuse the reader. His illustrations are apt and drawn from cases which truly have a bearing on situations such as frequently confront practicing engineers. All this goes to make the text not only readable and interesting, but also comprehensible to an extent that books on the subject seldom achieve. [*Legal Problems in Engineering*, by Melvin Nord, John Wiley & Sons, Inc., New York, $7.50].

NEMA MANUAL FOR ELECTRIC HOUSE HEATING

Appearing as authorized engineering information, this new manual, dated May 1956, is intended to provide technical data applicable, in general, to all types of electric house heating. It contains:

1. Recommendations for the insulation of residences using electric heating.
2. A method of computing heat losses and, thus, the kw heating capacity that needs to be installed in a home.
3. A method of estimating the annual kwhr consumption.

This manual is written in terms of watts and kilowatts, which are familiar to the electrical industry, as contrasted to most other heating guides, which are usually written in terms of British Thermal Units (Btu's).

STUDY OF THREE REDWOOD COOLING TOWER PACKINGS

By Wesley W. Smith*, College Station, Tex.

SUMMARY — Three packing styles having essentially the same vertical projected area made up of horizontally placed, rectangular cross section, redwood slats with width-height ratios of 0.36, 1.00, and 2.78, respectively, and essentially the same cross-sectional area were compared as to transfer and pressure drop in a 2- x 2-ft counterflow test section of variable height. The transfer per board foot of material was found to be greatest for the 2.78 ratio (flat type) packing. However, pressure loss was also the greatest for this style.

THREE types of redwood cooling tower packings were subjected to experimentation in efforts toward three objectives: (1) to obtain information of a fundamental nature on mass transfer and on resistance to air flow in various cooling tower packings; (2) to determine why individual cooling tower manufacturers have individual preferences as to packing types; and (3) to point the way toward improvement in packings.

The experimentation was accomplished in a 2- by 2-ft counterflow section which can handle packing arrangements up to 9 ft in height. It is an indoor installation specifically designed for evaluating[1] packing and other cooling tower components (see Fig. 1).

Several hundred tests performed with this equipment over a period of more than a year are the foundation for the following presentation.

Description of Packing and Details of Problem

In an effort to obtain as much information as possible on many of the variables known to effect cooling tower performance without creating an impasse of complexity, the testing was planned for 3 readily prepared and related packing styles each to be used with 3 vertical spacings and 3 thicknesses. Water flow rates ranging from approximately 1½ to 4½ gpm per sq ft and air velocities of from 275 to 550 fpm were considered as reasonable and easily obtained. Manual control of the water-on temperature at approximately 105 F was considered feasible but control of the wet-bulb and water-off temperatures too difficult and time consuming with the present equipment.

Fig. 2 and Table 1 show the details of the first packing tested. This 2-ft square packing unit made of ⅜ × 1 in. nominal dimension redwood slats placed on edge is a standard packing used by 2 large manufacturers of cooling towers.

The second type (Table 1) was made from 13 square slats each having a cross-sectional area of 0.35 sq in. spaced to maintain essential constancy of projected area.

The third type of packing tested (Table 1) was constructed of 8 of the same slats but arranged flatwise and the smaller number spaced to give essentially the same projected area as in the first type.

The 2 side pieces were ⅜ × 1 in. for all the packing units.

It should be noted that the slats used in all the packings have essentially the same cross-sectional area and that all packing units have essentially the same projected area. The number of slats and the amount of total surface area vary with the ratio, M, of slat width to height.

The mass transfer per cubic foot of tower volume per unit vapor content potential was taken as the criterion of performance and was obtained from the correlation of the results of numerical integration of the commonly used cooling tower equation:[2]

$$UV/L = \int_{T_t}^{T_i} \frac{dT}{h'' - h_a} \qquad (1)$$

Measuring of the makeup water was eliminated after the initial tests as values required for the evaluation of Equation 1 could be obtained without it.

The initial pressure drop measurements were obtained by the subtraction of the positive pressure in the plenum chamber with an unpacked tower from that with the subject packing. As the resistance to air flow through the eliminator and other parts of the tower was large compared to the resistance in the packing, the initial measurements were not entirely satisfactory. Therefore a special total pressure pickup device was installed resulting in more consistent results.

Mass Transfer Coefficient

To illustrate the general method used in the following development and to give some idea of the degree

Table 1—Details of Packings and Performance Data

Item No.		Tower Packings Tested		
		First Type	Second Type	Third Type
1	Ratio of packing slat cross-section — width /height, (M)	0.36	1.00	2.78
2	Slat width, inches	0.36	0.59	1.00
3	Slat height, inches	1.00	0.59	0.36
4	Slat cross-sectional area, sq in.	0.36	0.35	0.36
5	Number of slats per deck	21.	13.	8.
6	Projected area, (sq ft), per deck per sq ft of tower ground area	0.298	0.306	0.316
7	Board ft of material per deck per sq ft of tower ground area	0.298	0.181	0.113
8	Surface area, (sq ft), per deck per sq ft of tower ground area	2.26	1.21	0.86
9	Volume coefficient of mass transfer, U*, (for N=1; L=1250; and G=1250)	130.4	106.2	86.6
10	U per board ft (Item 9 ÷ Item 7)	438.	587.	765.
11	U per sq ft proj. area (Item 9 ÷ Item 6)	438.	347.	274.
12	U per sq ft surf. area (Item 9 ÷ Item 8)	57.7	87.8	100.6
13	P_t (pressure drop, inches water, per ft of height (for N=1; L=1250; G=1250)	0.00681	0.00699	0.00954
14	P_t per board foot (Item 13 ÷ Item 7)	0.0228	0.0381	0.0843
15	P/U (Item 13 ÷ Item 9)	0.522×10^{-4}	0.650×10^{-4}	1.102×10^{-4}

*The value of the coefficient U was obtained from Equation 3.

*Associate Research Engineer, Texas Engineering Experiment Station, Texas A. & M. College System.

[1] A Test Section for Evaluating Cooling Tower Components, by A. B. Alter (M.S. Thesis, A. & M. College of Texas, College Station, Tex., May 1953).

[2] HEATING, VENTILATING, AIR-CONDITIONING GUIDE, 1952, p. 760.

For presentation at the 63rd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Chicago, February 1957.

of approximation involved, typical test values of the dimensionless group, UV/L, with the corresponding values of the dimensionless group, L/G, are presented in Fig. 3. The three lines shown are represented by the general equation, $UV/L = C(L/G)^{-0.5}$, where C, which is also dimensionless, has a definite fixed value for each of the drawn lines. Values for C are entirely empirical, being dictated by the test data, and are an intermediate step in the development of Equation 2. The simplification of the problem resulting from the approximation might not be considered as justification for its use if it were not that even water

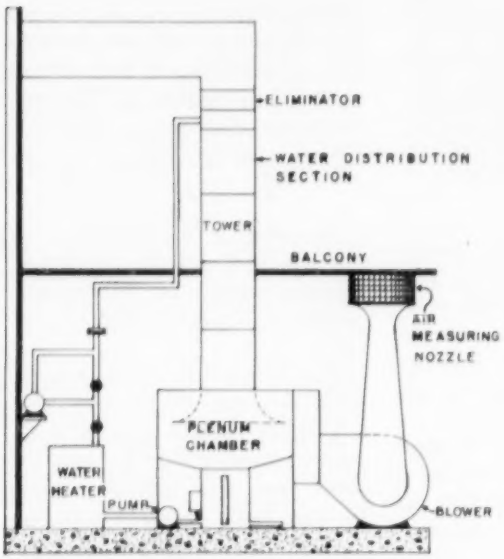


Fig. 1—Facility for 2- by 2-ft counterflow tests

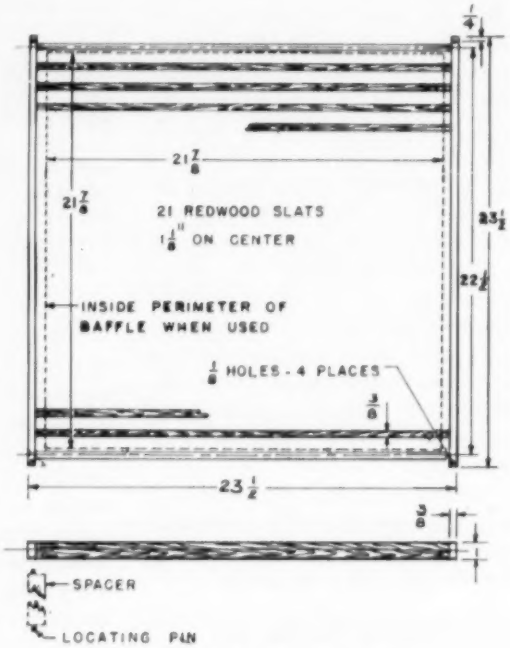


Fig. 2—Details of first packing tested

Symbols

G = mass air flow rate, pounds per (hour) (square foot of ground area).
h'' = enthalpy of saturated air at water temperature, Btu per pound dry air.
h_a = enthalpy of main air stream, Btu per pound dry air.
L = mass water flow rate, pound per (hour) (square foot of ground area).
M = ratio of packing slat cross-section width to height.
N = number of packing decks per foot of tower height.
P = pressure drop per foot of height, inches of water. (Is designated P' when obtained from Equation 4.)
P_G = pressure drop per foot of height attributed to air flow.
P_L = pressure drop per foot of height attributed to water flow.
R = coefficient in the pressure drop equation.
t = air temperature, Fahrenheit degrees.
T = water temperature, Fahrenheit degrees.
T_1 = water-on temperature, Fahrenheit degrees.
T_2 = water-off temperature, Fahrenheit degrees.
U = volume coefficient of mass transfer, pounds per (hour) (cubic foot) (unit vapor content potential) (pound per pound). (Is designated U' when obtained from Equation 5.)
V = cubic feet of total equivalent tower volume, cubic feet per square foot of ground area; or total height of equivalent tower, feet.
Z = packing height, feet.

Table 2—Typical Data Obtained in Tests

Test No.	L/G	UV/L	V	L	U^a	G	$M^{-0.2}$ [b]	$N^{0.5}$	$L^{0.5}$	$G^{0.5}$	U' [c]	N	Z
1026	1.50	0.48	5.11	2288	215	1526	1.227	1	47.8	39.1	195	1	3
1028	0.51	0.65	5.11	814	100	1596	1.227	1	28.5	40.0	119	1	3
1031	0.86	0.88	8.11	1388	151	1606	1.227	1	37.2	40.1	155	1	6
1034	0.52	1.52	11.11	859	115	1603	1.227	1	29.0	40.0	121	1	9
1036	1.43	1.00	11.11	2278	205	1597	1.227	1	47.7	40.0	199	1	9
078	0.87	0.69	4.49	1395	214	1607	1.227	1.414	37.4	40.1	221	2	3
980	1.41	0.92	7.49	2291	281	1625	1.227	1.414	47.9	40.3	284	2	6
982	0.54	1.51	7.49	878	177	1637	1.227	1.414	29.6	40.5	177	2	6
984	0.85	1.69	10.49	1391	224	1638	1.227	1.414	37.3	40.5	223	2	9
1019	0.88	0.89	4.06	1394	306	1591	1.227	2	37.4	39.9	311	4	3
1014	1.41	1.26	7.06	2273	405	1611	1.227	2	47.7	40.1	398	4	6
1016	0.55	2.10	7.06	874	260	1590	1.227	2	29.6	39.9	246	4	6
1002	0.86	2.17	10.06	1389	300	1606	1.227	2	37.3	40.1	312	4	9
1075	0.54	0.62	5.59	861	96	1587	1	1	29.3	39.8	99	1	3
1075	1.43	0.44	5.59	2278	179	1596	1	1	47.7	40.0	162	1	3
1077	0.87	0.78	8.59	1390	126	1601	1	1	37.3	40.0	127	1	6
1080	0.55	1.27	11.59	883	97	1604	1	1	29.7	40.0	101	1	9
1082	1.41	0.90	11.59	2260	175	1599	1	1	47.5	40.0	162	1	9
1085	0.87	0.63	4.85	1394	182	1606	1	1.414	37.3	40.1	180	2	3
1087	0.52	1.20	7.85	839	129	1605	1	1.414	29.0	40.1	140	2	6
1089	1.44	0.82	7.85	2281	239	1589	1	1.414	47.8	39.9	229	2	6
1092	0.85	1.38	10.85	1394	178	1655	1	1.414	37.3	40.4	181	2	9
1096	0.86	0.82	4.29	1389	265	1608	1	2.000	37.3	40.1	254	4	3
1098	1.42	1.01	7.29	2280	316	1609	1	2.000	47.8	40.1	326	4	6
1100	0.54	1.74	7.29	873	208	1606	1	2.000	29.5	40.1	205	4	6
1103	0.87	1.81	10.29	1386	244	1595	1	2.000	37.2	39.9	252	4	9
1047	0.84	0.50	6.18	1350	109	1606	0.814	1	36.7	40.1	101	1	3
1042	1.43	0.64	9.18	2283	159	1594	0.814	1	47.8	39.9	132	1	6
1044	0.55	0.95	9.18	881	91	1592	0.814	1	29.7	39.9	82	1	6
1039	0.88	1.11	12.18	1400	127	1597	0.814	1	37.4	40.0	103	1	9
1051	0.87	0.57	5.25	1385	150	1596	0.814	1.414	37.2	40.0	146	2	3
1054	1.40	0.76	8.25	2281	210	1627	0.814	1.414	47.8	40.3	188	2	6
1056	0.55	1.06	8.25	883	114	1610	0.814	1.414	29.7	40.1	116	2	6
1059	0.87	1.23	11.25	1388	152	1592	0.814	1.414	37.2	39.9	145	2	9
1062	1.44	0.55	4.59	2283	275	1582	0.814	2.00	47.8	39.8	263	4	3
1064	0.55	0.87	4.59	859	159	1588	0.814	2.00	29.0	39.8	160	4	3
1066	0.88	1.17	7.59	1389	214	1582	0.814	2.00	37.3	39.8	205	4	6
1069	1.41	1.15	10.59	2288	249	1619	0.814	2.00	47.8	40.2	266	4	9
1071	0.53	1.68	10.59	849	135	1586	0.814	2.00	29.0	39.8	160	4	9

[a] Obtained from test and integral.
[b] When $M^{-0.2}$ is 1, $M = 1$; when $M^{-0.2}$ is 0.814, $M = 2.78$; when $M^{-0.2}$ is 1.227, $M = 0.36$.
[c] Obtained from $U' = 0.085\ M^{-0.2}\ N^{0.5}\ L^{0.5}\ G^{0.5}$ (Equation 5.).

distribution and elimination of wall water were not attained. It was possible to develop the following equations from the test data.

$$UV/L = 0.085\, M^{-0.2}\, N^{0.5}\, V(L/G)^{-0.5} \quad (2)$$

Eliminating V from both sides and transposing L yields

$$U = 0.085\, M^{-0.2}\, N^{0.5}\, L^{0.5}\, G^{0.5} \quad (3)$$

This Equation 3 states that the mass transfer coefficient, U, increases as the 0.5 power of L, G and N, but decreases with the 0.2 power of the ratio of width to depth of slat cross-section.

All values of the coefficient U obtained from test and Equation 1 are shown in Fig. 4 with the corresponding values obtained from Equation 3. The agreement is considered good in view of the complexity of the problem and the known deficiencies of control.

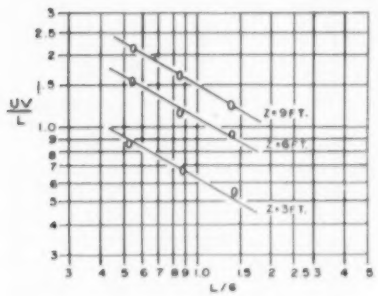


Fig. 3 (left) — Tower transfer characteristics

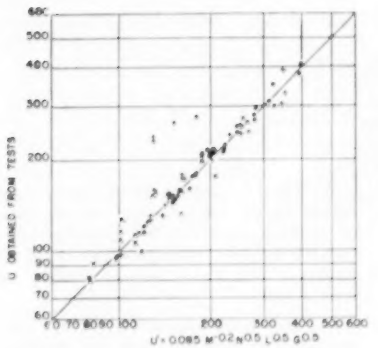


Fig. 4 (left)—Deviation of mass transfer test data from values given by the derived equation

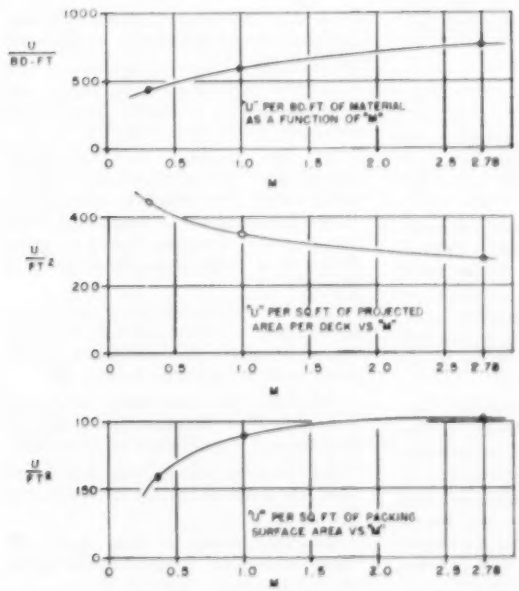
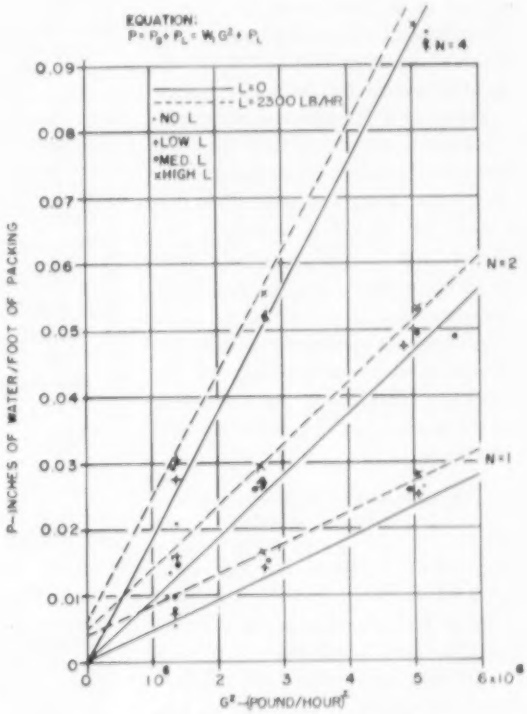

U/BD.FT
"U" PER BD.FT. OF MATERIAL AS A FUNCTION OF "M"
U/FT²
"U" PER SQ.FT. OF PROJECTED AREA PER DECK VS "M"
U/FT²
"U" PER SQ.FT. OF PACKING SURFACE AREA VS "M"
M

Fig. 5 (left)—Mass transfer comparisons



(Figure shows pressure drop per foot of packing for the tests when $M = 2.78$)

Fig. 6—Typical values of pressure drop obtained by tests

For the conditions $L = G = 1250$ lb per hr and $N = 1$, the value for U per board foot of packing material is presented in Fig. 5 as a function of M as is also U per sq ft of projected area per deck and U per sq ft of surface area. Table 1 contains the values just mentioned and also the important physical dimensions on the 3 packing styles.

Pressure Drop

Resistance proved to be essentially linear with packing height, and therefore few measurements were taken except for the maximum number of sections. Calibration pressure drop values obtained for the facility with no sections were subtracted from the

3 section manometer readings before calculating P. Since the resistance with no water flow appeared to be very nearly proportional to the flow indicating manometer reading, it was plotted as a function of G^2. Fig. 6 shows typical values of pressure drop obtained by test. The additional resistance caused by the water is represented as a constant value for any packing configuration and air flow and for simplicity is considered linear with water flow. The solid lines represent the no-water resistance, the dotted lines the resistance with 2300 lb of water per hr per sq ft of tower cross section.

An analysis of these data led to the development of an equation for the resistance to air flow as a function of the packing style, spacing amount, and rates:

$$P = P_0 + P_L = (23 + 9M)(10^{-10})\ NG^2 + RN^{0.33}L \qquad (4)$$

Note that R takes on the value of 2.17×10^{-6}, 1.52×10^{-6}, and 1.65×10^{-6} respectively for M values of 0.36, 1.00, and 2.78.

All measured values for pressure drop are shown as ordinates in Fig. 7 with the corresponding values calculated from Equation 4 as abscissas.

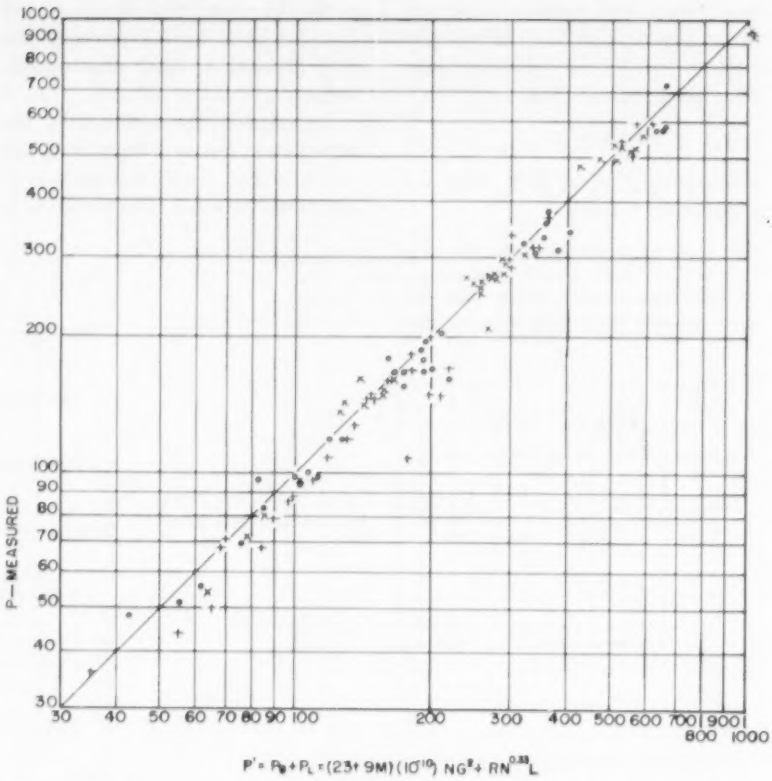


Fig. 7—Deviation of pressure loss test data from values given by the derived equation

Comparative Costs

As in so many engineering problems, the final comparison must be made on an economic basis in order to evaluate properly both the investment costs and operating costs. However, since each cooling tower installation has its own set of economic variables — cost of materials, cost of land, local restrictions, cost of labor, cost of power, water treatment and availability, conditions of operation, and others, no formal treatment will be attempted.

Nevertheless, comparative cost calculations based on what are believed to be representative values for the many variables lead to the following statements:

1. The cost of the tower structure itself, the accessory equipment, and the cost of operation exclusive of that for air moving are normally large compared to the packing and air moving costs and therefore there is little reason to defend one of the three packing styles over the other two.

2. However, unless the packing material is very high in price or the electrical power rate is very low, of the types tested, the packing having the lower value for M would appear to be the least expensive based on a capitalized cost method of analysis.

Conclusions

1. The value of the transfer coefficient per unit volume "U" was found to be essentially the same for all heights of a given packing.

2. The value of the transfer coefficient was found to vary approximately as the 0.5 power of the mass water flow rate, L.

3. The value of the transfer coefficient was found to vary approximately as the 0.5 power of the mass air flow rate, G.

4. The transfer coefficient was found to vary approximately as the 0.5 power of the number of packing decks per ft of tower height, N.

5. The transfer coefficient was found to be the greatest per board foot for the packing having the highest value for the ratio of packing slat cross-section width to height, M.

6. The transfer coefficient was found to be the greatest per sq foot of surface area for the packing having the highest value for the ratio of packing slat cross section width to height, M.

7. The pressure drop varied approximately directly with the packing height.

8. The pressure drop varied approximately as the square of the mass air flow rate, G.

9. The pressure drop varied approximately as a linear function of the mass water flow rate, L.

10. The pressure drop attributed to air flow varied approximately directly with the number of packing decks per ft of tower height, N, while the pressure drop attributed to water flow varied approximately as the 1/3 power of N.

11. The pressure drop attributed to air flow was greatest for the high value of the ratio of packing slat cross-section width to height, M.

12. The pressure drop attributed to water flow changed little with M but showed a minimum at $M = 1.5$.

13. The pressure drop per board foot was greatest for the high value of M.

14. The pressure drop per unit value of transfer coefficient was greatest for the high value of M.

HEAT LOAD CALCULATIONS BY THERMAL RESPONSE

By W. R. Brisken*, Bloomfield, N. J., and S. G. Reque**, Schenectady, N. Y.

SUMMARY — A new method of making heat load calculations is presented. The method starts out from electrical analogue representation of the problem and makes it possible to solve even complicated problems without using analogue computers. Instead of using artificial design conditions, this thermal response method punches business machine cards with actual weather data as recorded by the U.S. Weather Bureau; determines thermal response factors, and uses these factors to calculate loads by hand, by a desk calculator or a digital computer.

Samples are presented to demonstrate some of the diversified calculations possible with this method. A new application method based on thermal response is developed.

DURING recent years great efforts have been made to calculate more accurately the heating and cooling load requirements of buildings. Electrical analogues have been used especially when storage capacities of building materials needed to be considered. Various authors have presented results of electrical analogue computer calculations. They have clearly demonstrated the progress which has been made toward more realistic load determinations.

It is appropriate to consider applying this accumulated wealth of research results to routine load problems. A modest attempt was made by the authors et al[1] previously. Steady-state load factors were modified to *include* transient effects, and special *allowances* were recommended for internal heat storages of the buildings. This procedure resulted in better accuracy than had been obtained by the steady-state method. But still, it could be considered only as an intermediate step. The thermal response method here discussed is a further development.

Thermal Response Method

An electrical resistance-capacitance circuit is characterized by its response, in output current, to an input pulse which may be a temporary change of potential at the input side. It has been shown before[1] that building structures can be considered as resistance-capacitance circuits. A wall can be represented reasonably well by a π-circuit consisting of 3 resistances and 2 capacitances (Fig. 1). If constant temperature throughout the system is assumed, there can be no flow of heat. However, if the outdoor temperature is raised suddenly and after a short interval is reduced to the original level, heat will flow from the wall to the indoor air according to a definite sequence which is a characteristic of the wall circuit. This sequence is the thermal response of the wall to an outdoor temperature pulse or square wave. Fig. 2 shows a temperature pulse and a typical response curve.

Thermal response curves can be calculated readily as shown in Appendix A‡. For general application, however, it is more convenient to use numbers than curves. A changing outdoor condition (*i.e.* temperature or solar radiation) may be considered as a sequence of square waves of constant duration and varying amplitude (Fig. 3). Accuracy of the calculations is best when the time intervals are very short, but is still adequate when they are each as long as 1 hr. This is convenient because weather data are recorded in hourly intervals by the U.S. Weather Bureau and are punched on business machine cards. These data can be used immediately as input information.

It is convenient to use the same length of periods for the response of the circuit as for the input pulses. The response of a structure (such as a wall or roof) on a unit basis, (*i.e.* per square foot area perpendicular to direction of heat flow and per Fahrenheit degree difference between outdoor-indoor temperature) may now be expressed in response factors. Fig. 4 shows a typical sequence of response factors as result of a unit pulse. Furthermore, thermal systems, as considered here, are linear and the principle of super-position applies to them. Therefore, the resultant response to a sequence of input pulses is calculated by simply adding the hourly responses following each input pulse.

The heat flow through a structure can now be calculated for varying outdoor temperature and constant indoor temperature. The instantaneous value of heat flow per square foot for the hour n becomes:

$$q_n = (T_n - T_i)(F_1) + (T_{n-1} - T_i)(F_2) + (T_{n-2} - T_i)(F_3) + \ldots\ldots\ldots + (T_{n\,m-1} - T_i)(F_m) \quad \ldots\ldots(1)$$

and for the total structure:

$$Q_n = A(q_n) \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

where

T = temperature.
F = response factor with subscripts denoting hour of response.
A = area of structure perpendicular to heat flow.
i = subscript denoting indoor condition.
n = subscript denoting hour for which calculation is made. n-1 is preceding hour, and so on.
m = number of hours to have sufficient length of response for reasonable accuracy.

The discharge flow response to a unit input pulse is known as *transfer admittance* in electrical network theory. For heat transfer representation it may be called *transfer heat admittance*. Accordingly, the response factors are *transfer heat admittance factors*. Since transfer heat admittance factors are a function of the structure only, they need to be calculated but once for each construction. They have permanent value and can be used from then on wherever the same construction is involved. Equation 1 is an example for calculation of transient heat flow by using the transfer heat admittance factors, F_1, F_2, and so on.

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**Systems Analysis Engineer, Electrical Engineering Laboratory, General Engineering Laboratory, General Electric Co.

[1]Exponent numerals refer to Bibliography.

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‡It is expected that Appendixes A, B, and C will be published in TRANSACTIONS.

Journal Section

In many cases it is sufficient to calculate the heat flow into (or out of) a building for constant indoor temperature. Using transfer heat admittance factors for the respective structure, such calculations can be performed by hand, desk calculator or any digital computer according to the amount of calculations needed and the computing equipment available.

However, in other cases, it will be of interest to determine the change of indoor temperature as a function of heat flow. Again electrical network theory provides a practical way of solving this problem, *i.e.* by applying Thevenin's Theorem[2]. In terms of the heat load problem, Thevenin's Theorem can be explained as follows, referring to the wall circuit of Fig. 1.

If constant temperature throughout the system is again assumed there is no flow of heat. Heat flow can be initiated by changing either the outdoor or the indoor temperature. But, a temporary drop of indoor temperature will produce a different sequence of heat flow, from the interior surface of the wall to the indoor air, than would be caused by a rise of outdoor temperature. Heat flow response to an outdoor temperature pulse has been shown in Fig. 2. If the concept of heat flow response to a temperature pulse is applied to a drop of indoor temperature, the sequence will be as shown in Fig. 5. Positive values denote heat flow to the indoor air and negative values signify heat flow away from the indoor air. While the indoor temperature is down, heat flows out of the wall causing the temperature of the wall to drop. After the temperature pulse has terminated, and original indoor temperature is restored, the wall has temporarily a lower temperature than the indoor air. The wall must absorb heat from the indoor air to re-establish temperature balance.

Both heat flow responses on unit temperature difference basis are admittances when viewed from the indoor air. Heat flow response to changing outdoor conditions, with indoor temperature kept constant, was previously called transfer heat admittance. In electrical network theory the term *driving point admittance* is used for the response to a unit change of potential at the observed point. For heat transfer problems it may be called *control point heat admittance*.

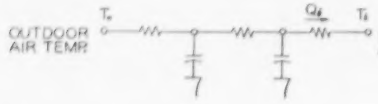

Fig. 1—Thermal π-circuit of a wall

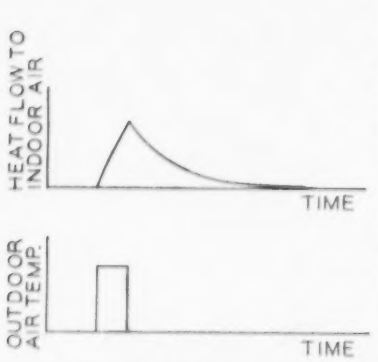

Fig. 2—Outdoor temperature pulse and typical indoor heat flow response

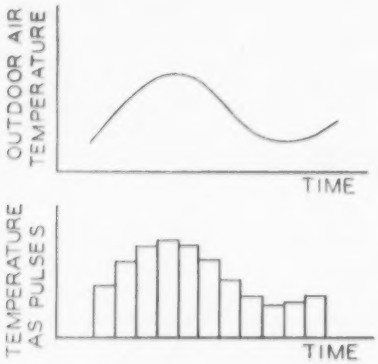

Fig. 3—Temperature curve and equivalent sequence of temperature pulses

Thevenin's Theorem applied to the heat load problem says that the change of indoor air temperature with respect to a reference indoor temperature is a function of the 2 admittances. It is:

$$\Delta T_i = \Delta T_o \ (\partial Q_i/\partial T_o)/\partial Q_i/\partial T_i \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

In this equation, $\Delta T_o \ (\partial Q_i/\partial T_o)$ is the total heat flow into (or out of) the building due to difference between outdoor and reference indoor temperature, ΔT_o, with $\partial Q_i/\partial T_o$ being the summation of the transfer heat admittance of all structures. The partial derivative $\partial Q_i/\partial T_i$ is the control point heat admittance of the entire building.

The transfer heat admittance $\partial Q_i/\partial T_o$ and control point heat admittance $\partial Q_i/\partial T_i$ are functions of the storage capacities of the structures. Considering a complete building it should be recognized that the control point heat admittance must include the branches for internal storage such as partitions and furniture. A change in indoor temperature will be followed by gain or release of heat by the internal storages. This is obviously not the case for the transfer heat admittance since by definition the indoor temperature is maintained constant. For calculation of control point heat admittance factors see Appendix A.

For machine calculations it is advisable to avoid divisions. Equation 3 therefore may be modified to read:

$$\Delta T_i = \Delta T_o \ (\partial Q_i/\partial T_o) \ (\partial T_i/\partial Q_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The new term $\partial T_i/\partial Q_i$ is known in electrical network theory as *driving point impedance*. For thermal circuits it may be called *control point thermal impedance*. It would be difficult to calculate control point thermal impedance factors $\partial T_i/\partial Q_i$ from the differential equations for the entire building. However, the control point heat admittance factors $\partial Q_i/\partial T_i$ for the individual circuit branches can be added up to give the control point heat admittance for a complete building. From the control point heat admittance it is possible to calculate the control point thermal impedance by a process known as inverse convolution[3]. Details of the calculations are given in Appendix A.

Summarizing, calculations by the thermal response method may be performed in 3 distinct steps:

1. Calculation of heat load for varying outdoor conditions and constant indoor temperature.

2. Calculation of indoor temperature variation from design temperature due to changed control setting or as result of excess or insufficient capacity.

3. Calculation of heat load change as result of indoor temperature variations.

A schematic diagram of the 3 steps is given in Fig. 6.

The thermal response method can be used with precision. Only 2 factors influence the accuracy *viz.*: (*a*) the analogue representation of the thermal circuit and (*b*) the duration of each time element for input functions and response. Factor (*a*) may

easily be checked by comparison of calculation with test results. As to the time element for input functions and response factors it is believed that the selection of hourly values is a compromise satisfactory for most calculations with the exception perhaps of control system evaluation.

It may appear that the effort required to calculate thermal response factors for the many different constructions used throughout the country is too great. However, the response factors have permanent value and need to be calculated only once. Because this is so, it will be practical to use one of the large digital computers designed for engineering calculations. It would be only natural that tabulations of response factors would be publishd in appropriate handbooks such as THE GUIDE*.

Experimental Proof of Thermal Response Calculations

As stated, there are 2 factors which may influence the accuracy of calculations by the thermal response method. It is, therefore, important to compare calculated data with test results. It is possible that laboratory methods for measuring transient thermal response of structures will be developed. Measuring of thermal conductivities and film coefficients may be mentioned as precedents.

However, at present it is necessary to rely on comparisons of calculated values with heat flow measurements for which test conditions are sufficiently defined. This technique does not separate the effect of approximations in the analogue circuit from the effects of using finite rather than infinitesimal time intervals for the response factors.

In a previous study[1] test data of the University of Illinois, taken on their Research Residence No. 2[2], were compared with electrical analogue computer calculations which used a rather simple analogue circuit of the entire house. The calculated maximum load exceeded the corresponding test value by only 7 percent. This check was accepted as evidence that the analogue represented the house with good engineering accuracy.

*HEATING, VENTILATING, AIR CONDITIONING GUIDE (published annually by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, New York, N.Y.).

In the present study test data for the west wall of the same Research Residence are used for comparison with calculated values. The wall was considered as π-circuit in the same manner as in the earlier study. Transfer heat admittance factors computed for the wall are listed in Table 1. The west wall was selected to avoid direct solar radiation effects. It was feared that the unavailability of local solar observations might limit the validity of the intended comparison. For the same reason the calculations were limited to the hours from 5:00 a.m. to 12 noon. Fig. 7 shows the result. The curve of test values was taken from Reference 3. It represents measurements by a heat flow meter installed in the indoor wall panels near their inside surfaces. The calculated values are for heat flow from the interior wall surface to the air. The calculated curves are much smoother than the test curves. During the very early morning hours of the test day, the outdoor temperature did not follow a smooth curve. These irregularities apparently penetrated the wall up to the flow meter. The additional capacitance of the interior wall panel seems, however, to have been large enough to filter out that effect. Later, when the outdoor temperature followed a more regular course the flow meter data also became more uniform.

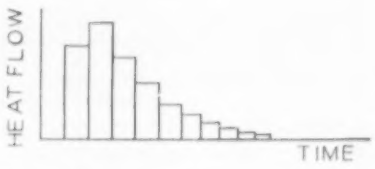

Fig. 4—Square-wave representation of heat flow response factors

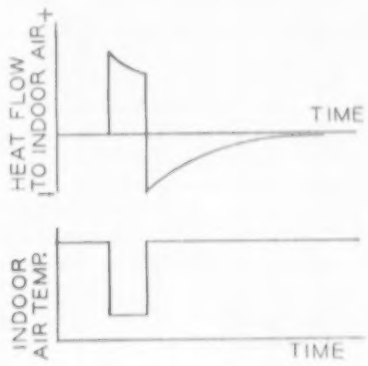

Fig. 5—Indoor temperature pulse and typical indoor heat flow response

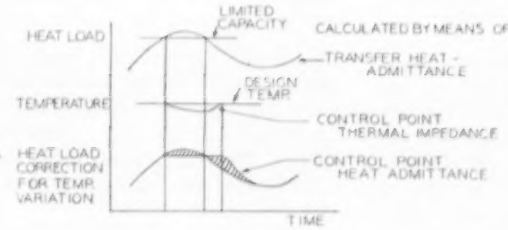

Fig. 6—Schematic diagram for calculations by the Thermal Response Method

Table 1—Transfer Heat Admittance Factors for Wall of Research Residence No. 2, University of Illinois

Hour of Response	Btu per hr (F deg) (1000 sq ft)
n	5.99
n + 1	35.91
n + 2	12.47
n + 3	8.75
n + 4	6.07
n + 5	5.99
n + 6	5.04
n + 7	1.90
n + 8	1.35
n + 9	0.95

Without allowance for diffuse radiation, the calculated curve deviates from the measured more and more as the intensity of solar radiation rises during the day. Additional calculations were performed to include diffuse radiation. Since it was not known how clear the atmosphere was at the test location, data were used for both clear and industrial atmosphere respectively, as recorded in THE GUIDE*. It is felt that the results are gratifying and should create confidence in the thermal response method. It is hoped that future comparisons can be more extensive and made in greater detail.

Calculations by the Thermal Response Method

Many different types of calculations can be based on the thermal

response method. Determination of specific response factors for individual constructions, *i.e.* on unit area and unit temperature difference basis, is rather involved as shown in Appendix A. It is advisable to use one of the larger digital computers designed for engineering calculations. Unit response factors have permanent value since they can be used wherever the same constructions are involved. Calculations using unit response factors can be performed by hand, desk calculator or digital computers as available in accounting offices.

The first step in solving a transient heat flow problem is to reduce the thermal circuit of a building to its electrical analogue. The technique for doing this is the same as reported previously[1]. A single-story house with basement and attic was selected as an example. The analogue circuit was kept as simple as possible to demonstrate the technique without complications of secondary importance. Based on the previous experience with analogue computer calculations, it is believed that the simplified circuit shown in Fig. 8 provides results sufficiently accurate for most purposes.

The sample house has 1800 sq ft of floor space. Walls are of frame construction with no insulation. They are represented by a π-circuit in Fig. 8. Windows and equivalent doors amount to 25 percent of the total wall area. It was assumed that Venetian blinds were fully drawn during the whole day, or that curtains or drapes would produce an equivalent thermal resistance when Venetian blinds were open. Accordingly, windows are shown as a double resistance circuit.

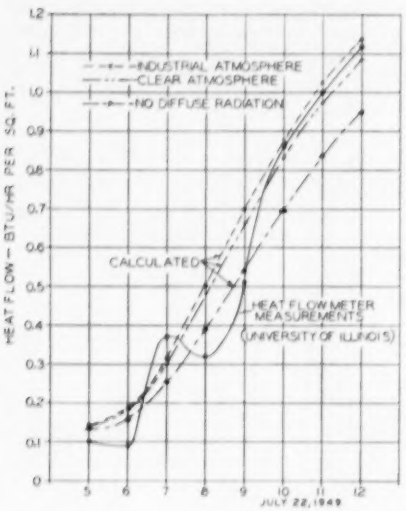

Fig. 7—Comparison of calculated results and test data[3]

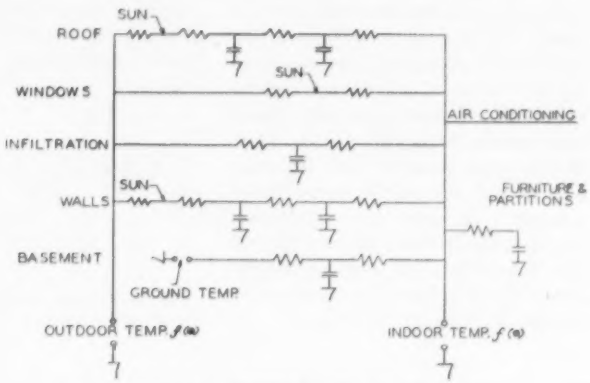

Fig. 8—Simplified thermal circuit of single-story house with basement

Heat from solar radiation enters the circuit between the 2 resistances. The house has a pitched roof with natural ventilation of the attic space by louvers. The ceiling is insulated with 4-in. mineral wool blankets. Roof and ceiling are considered as 1 π-circuit. Infiltration (including forced ventilation) is represented by a T-circuit. A T-circuit, instead of a straight resistance, was considered appropriate since infiltration does not affect the temperature throughout the house instantly but rather goes through a transient. The basement is assumed entirely below ground, and walls and floor are assumed exposed to a uniform ground temperature constant throughout the year. This is expressed in the diagram by a T-circuit with a constant potential at the ground terminal. Furniture and interior partitions form an L-circuit. This branch is a compromise lumping all interior storages (which actually have different thermal characteristics). The line labelled *air conditioning*, indicates an ideal year-round air-conditioning unit capable of maintaining a uniform and constant house temperature. Provisions for controls are, therefore, not shown in the circuit.

After the analogue circuit is laid out, the circuit parameters are determined. The individual thermal resistances and capacitances are calculated from the thermal conductivity

Table 2—Typical Response Factors*

Transfer Heat Admittance	Btu per (hr) (F deg)	Hour n	n + 1	n + 2	n + 3	n + 4	n + 5	n + 6
Ceiling-Roof	Per 1000 Sq Ft	0.85	2.79	4.49	5.28	5.50	5.38	5.08
Wall	Per 1000 Sq Ft	31.40	67.10	59.29	38.10	23.37	14.21	8.63
Windows, Doors	Per Sq Ft	0.70	—	—	—	—	—	—
Infiltration	Per Air Change/Hr	99.8	114.6	42.2	15.5	5.7	2.1	0.8
Total House		409.2	202.8	123.8	72.2	44.6	29.4	20.6
Control Point Heat Admittance								
Ceiling-Roof	Per 1000 Sq Ft	147	−10.4	−9.0	−7.7	−6.7	−5.8	−5.1
Wall	Per 1000 Sq Ft	827	−435	−77.4	−25.6	−15.1	−7.7	−4.7
Windows, Doors	Per Sq Ft	0.70	—	—	—	—	—	—
Infiltration	Per Air Change/Hr	280	—	—	—	—	—	—
Floor	Per 1000 Sq Ft	449.4	−38.94	−31.78	−25.94	−21.17	−17.28	−14.11
Partitions, Furniture	Per 1000 Sq Ft Floor Area	1196	−1018	−150.6	−22.22	−3.59	—	—
Total House		4800	−2462	−440	−133	−72	−56	−40
Control Point Thermal Impedance of Total House, per F deg per 1000 BTU/hr		0.2090	0.1115	0.0783	0.0575	0.0439	0.0348	0.0283

*Response factors listed in this table are for the house described in this paper.

and heat capacities of the individual structural materials used, and from the film coefficients for the various surfaces. Most of the resistances and capacitances in the circuit diagram are composite values for convenience of calculation. Transfer heat admittance factors and control point heat admittance factors are then computed for the individual circuit branches as outlined in Appendix A. As mentioned before, control point thermal impedance cannot be used for individual branches of a circuit. It is therefore necessary to calculate the control point heat admittance for the complete house and, using this value, to calculate the control point thermal impedance for the house. This procedure is also explained in Appendix A, and typical response factors are listed in Table 2.

A great advantage of the thermal response method is that actual weather data can be used as input functions. This makes the calculations realistic. Outdoor air temperature, solar radiation and wind velocity were included in the present calculations. The information was taken from business machine cards especially prepared by the U.S. Weather Records Center in Asheville, N. C. The card used is one entitled *Solar Radiation — Hourly Records* supplemented and extended with information from a card entitled *WBAN Hourly Surface Observation*. Due to space limitations, this card is not shown here.

For thermal response calculations it is convenient to use solar radiation in the same manner as in the sol-air concept. This means calculating a fictitious temperature which would produce the same heat flow as solar radiation. It is

$$(\Delta T)_R = R_L\ K\ C_i\ \tau\ \epsilon\ (1/U) \quad .....(5)$$

where

$(\Delta T)_R$ = fictitious temperature elevation over free air temperature.

R_L = solar radiation in Langleys per hour.

K = conversion factor from Langleys per (hour) to Btu per (hour) (square foot).

C_i = incidence factor to transform horizontal radiation values to those for other surface angles.

τ = transmission factor (used for windows).

ϵ = absorptivity for solar radiation.

U = overall heat transfer coefficient between outdoor air and surface receiving solar radiation.

Wind conditions were considered only as they influence the rate of infiltration. A preliminary check indicated that the overall circuit response would not change appreciably with variations of outdoor film coefficients. Only for very low wind velocities, which occur rarely, could the accuracy be improved. However, the complication of variable film coefficients can hardly be justified. Accordingly, a wind velocity of 15 mph was assumed in selecting outside film coefficients. Infiltration, in contrast, is very sensitive to wind velocity. Expressed in terms of air changes per hour, infiltration can be assumed as a straight line function of wind velocity, above a minimum of ½ air changes per hour[5]. Response factors for infiltration differ from those applying to conduction loads. They are consequently expressed, on a unit basis, per degree outdoor-indoor temperature difference per air change per hour.

Peak Loads and Cumulative Loads

One of the main objectives of load calculations is to determine the peak heating and cooling loads so that proper selection of equipment can be made. It is of interest also to obtain information on operating costs. These 2 objectives are met by a year-round heat load calculation for constant indoor temperature. Equations 1, 2 and 5 are used with transfer heat admittance factors for the respective constructions.

A year-round calculation was made for the house the analogue for which was drawn as Fig. 8. Weather records for New York City for the year from July 1, 1952 to June 30, 1953 were used. While that year may not have had extreme weather conditions, it serves for demonstration of the technique.

Calculations were performed on a 602A calculator in an accounting department. They were made in this sequence: conducted loads for walls and roofs, conducted plus radiation loads for windows and equivalent doors, infiltration load, and summary of all loads including allowance for basement load. Because of computing machine limitations, radiation on walls and roof was neglected and transients were limited to 6 hr. It should also be noted that the assumptions made for the basement result

Table 3—Portion of chart of hourly heating loads tabulated from business machine cards

Location	Construction	Year	Month	Day	Hour	Outdoor Temp.	Radiation on Horiz. Surface	Wind (mph)	Indoor Temp.	Wall and Roof Loads	Computing Factor	Window Load	Computing Factor	Infiltration Load	Total Load	Marker	Daily Total Heating Load	Daily Total Cooling Load	
1	14B1A	52	12	27	16	33	1.5	20	75	13128—		11298—	65—	11145—	43701—				
1	14B1A	52	12	27	17	30		35	75	13575—		12105—	137—	16503—	50313—	4			
1	14B1A	52	12	27	18	28		36	75	14166—		12045—	148—	22954—	57895—	5			
1	14B1A	52	12	27	19	25		30	75	14897—		13450—	128—	24493—	60975—	6			
1	14B1A	52	12	27	20	22		32	75	15709—		14257—	145—	25284—	63380—	6			
1	14B1A	52	12	27	21	20		30	75	16557—		14795—	140—	26088—	65570—	6			
1	14B1A	52	12	27	22	19		30	75	17349—		15064—	143—	26181—	66724—	6			
1	14B1A	52	12	27	23	17		30	75	18025—		15602—	148—	26676—	88451—	7	1,046,901—		
1	14B1A	52	12	28		17		35	75	18595—		15602—	177—	29095—	71420—	7			
1	14B1A	52	12	28	1	17		30	75	18975—		15602—	148—	29502—	72207—	7			
1	14B1A	52	12	28	2	16		38	75	19220—		15371—	198—	31522—	74745—	7			
1	14B1A	52	12	28	3	15		30	75	19453—		16140—	155—	31805—	75528—	7	← PEAK HEATING LOAD		
1	14B1A	52	12	28	4	14		29	75	19717—		16409—	149—	29343—	75599—	7			
1	14B1A	52	12	28	5	14		27	75	19944—		16409—	137—	27359—	71842—	7			
1	14B1A	52	12	28	6	13		26	75	20162—		16678—	133—	25817—	70737—	7			
1	14B1A	52	12	28	7	13	.4	21	75	20373—		16678—	102—	22880—	58081—	7			
1	14B1A	52	12	28	8	13	9.6	19	75	20521—	55	7263—	90—	19472—	55386—	5			
1	14B1A	52	12	28	9	15	22.7	20	75	20525—	55	1883—	93—	17805—	48343—	4			

in a constant load for that branch when the indoor temperature is considered constant.

A year-round constant indoor temperature of 75 F was selected for the example. Important calculation results were printed on strip charts. Table 3 is a chart section for the peak heating load extended to include several hours before and after. More extended charts for both the heat peak load and the cooling peak load are included in the Appendix as Tables B-1 and B-2. For convenience in finding high load conditions special markers were used in these charts (see Table 3) with the following meanings:

Load	Percent of Peak Load
1: sensible cooling load above	90
2: sensible cooling load above	80
3: sensible cooling load above	70
4: heating load above	60
5: heating load above	70
6: heating load above	80
7: heating load above	90

Neither peak heating nor cooling load coincided with the extreme temperatures of the year. The maximum sensible cooling load (Table B-1) occurred on September 13, 1952 at 3:00 p.m.; at which time the outdoor temperature was 93 F as compared to extremes of 96 F on several days in July. However, the solar altitude on September 13 is lower than in July, producing a considerably higher radiation load on the house and accounting for the peak load.

Maximum heating load occurred on December 28, 1952 at 3:00 a.m. (Table 3). Again the outdoor temperature of 15 F was less severe than the extreme of 13 F several hours later. But at the peak load conditions a wind velocity of 30 mph raised the infiltrated load sufficiently (31800 Btu/hr as against 25,800 Btu/hr) to raise the heating load to a maximum.

Having found the extreme loads, a comparative calculation was made by hand for these hours. While transfer heat admittance factors for 6 hr was used in the computer calculations, they were extended to 7 hr for the hand calculations. Furthermore, solar radiation effects were included in the calculations of wall and roof loads. A comparison of hand calculations and computer results is given in Table 4. The error due to neglecting solar radiation on roof and wall is 15.4 percent. This is not consistent with the precision obtainable with thermal response calculations. Therefore, solar radiation on wall and roof ought to be included in future machine computations. Comparison of 7-hr and 6-hr transients shows a difference of 11.9 percent for the ceiling-roof circuit. This is not surprising since the response at the 6th hour is barely beyond its peak due to the high time constant of that circuit. But, due to the low absolute value of this branch, the effect on the total result is only 0.3 percent.

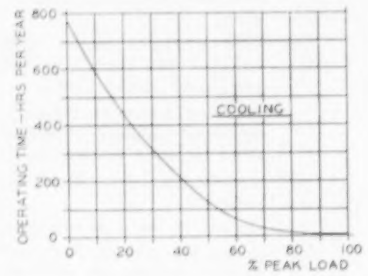

Fig. 9—Cumulative hours of cooling operation at or at more than stated load

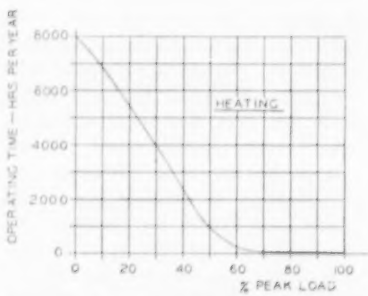

Fig. 10—Total cooling demand in 10 percent increments of peak load

Hourly heating and cooling loads were added up to provide daily, monthly and yearly cumulative values. Monthly and yearly totals are listed in Table 5. Part load requirements can also be evaluated easily from year-round load data. Figs. 9 and 10 list as ordinates the number of hours for which the load is equal to or in excess of the percentage of peak load used as abscissae. Cumulative values of part loads are shown in Figs 11 and 12 as bar charts. Increments of 10 percent each are used as abscissae. Since the computer calculated only sensible loads, they were adjusted to include the latent portion. A total of 12,000 Btu/hr was assumed for a sensible cooling load of 8600 Btu/hr.

Variation of Indoor Air Temperature

In the preceding calculations it was assumed that the indoor air temperature was kept constant by heating and cooling equipment which matched the load demand perfectly at all times. In many cases it will be of interest to know how the indoor temperature would deviate from the design temperature when the capacity is less than, or more than, design value, and how temperature and load would follow a changed control setting.

Temperature variations are calculated by using control point thermal impedance factors for the entire house. The difference between heat

Table 4—Peak Loads — Breakdown by Circuit Branch and Calculation Details

Time of peak load	Circuit branch	Btu per hr			Effect of Radiation			Difference of 7 hr vs. 6 hr Transient consideration		
		Computer	Hand calculated		Btu/hr	Percent of branch load	Percent of total load[a]	Btu/hr sens.	Percent of branch load	Percent of total load[a]
9-13-52 3:00 p.m.	Walls	5,081	6,451	— 8,566	1,853	28.7	6.2	96	2.1	0.4
	Roof		2,115		1,426	68.4	4.8	82	11.9	0.3
	Windows	17,485	17,542		12,700	72.4	42.7	—	—	—
	Floor	— 8,130	— 8,130		—	—	—	—	—	—
	Infiltration	3,325	3,333		—	—	—	15[b]	0.4[b]	<0.1[b]
	Total, sens.	17,761	21,311		15,979	—	53.7	191	—	0.9
	Total[a]	24,782	29,755		—	—	—	—	—	—
12-28-52 3:00 a.m.	Walls	−19,453	−17,499		—	—	—	589	3.4	0.8
	Roof		− 3,024		—	—	—	501	16.6	0.7
	Windows	−16,140	−16,140		—	—	—	—	—	—
	Floor	− 8,130	− 8,130		—	—	—	—	—	—
	Infiltration	−31,805	−32,056		—	—	—	207[b]	0.6[b]	0.3[b]
	Total	−75,528	−76,829		—	—	—	1,297	—	1.7

[a]Sens + latent.
[b]Difference of 7 hr vs 5 hr transient consideration.

load and actual available capacity can be treated like a transfer heat admittance. Accordingly, using this difference for the term $\triangle T_o$ $(\partial Q_i / \partial T_o)$, Equation 4 gives the indoor temperature deviation due to insufficient or excess capacity.

A change of temperature is followed in turn by a change of heat flow. Corrections for heat flow values are calculated using control point heat admittance factors. These are identical with the basic heat load calculations, Equations 1 and 2.

Temperature variations due to insufficient capacity were calculated by

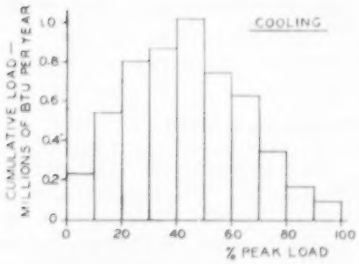

Fig. 11—Cumulative hours of heating operation at or at more than stated load

hand for the house discussed for the night of peak heating load. Fig. 13 shows the indoor temperature as a function of time for 3 different percentages of capacity available *viz.*: 90, 80 and 70 percent of peak load. Outdoor temperature and wind velocity are also plotted. It can be seen that lowest indoor temperature did not occur at the time of lowest outdoor temperature, but was influenced more strongly by very high wind velocity.

Table 5—Monthly and Yearly Total Heating and Cooling Loads

Month	Heat Load Btu	Sensible Cooling Load, Btu	Sensible plus Latent Load, Btu[a]
July '52	2,972,860	1,433,521	2,000,264
Aug.	4,948,572	694,127	968,550
Sept.	6,785,790	709,576	990,107
Oct.	14,514,611	99,021	138,169
Nov.	18,452,044	8,553	11,934
Dec.	26,005,740	—	—
Jan. '53	26,125,341	—	—
Feb.	22,555,956	—	—
Mar.	22,023,762	—	—
Apr.	17,397,676	6,088	8,495
May	11,897,975	111,170	155,121
June	5,679,422	839,763	1,171,765
Total year	179,357,749	3,901,819	5,444,403

[a]Allowance for latent load is made by rating total load at 12,000 Btu/hr for 8500 Btu/hr calculated sensible load.

Fig. 14 demonstrates the effect of thermostat setback on temperature and heat load for the same night as considered for Fig. 13. Cumulative loads corresponding to constant temperature and to night setback may be compared to indicate that savings of approximately 5 percent for 5 F and 11 percent for 10 F setback can

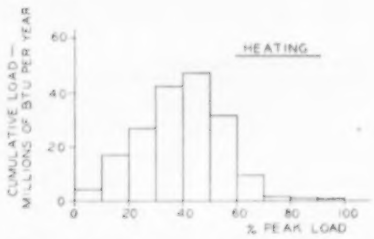

Fig. 12—Total heating demand in 10 percent increments of peak load

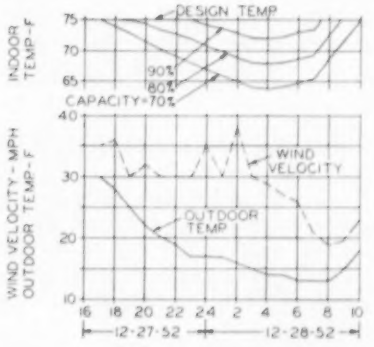

Fig. 13—Variation from design indoor temperature for various percent design capacity. Corresponding outdoor temperatures and wind velocities are shown in lower portion of graph

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be realized under the conditions of the example.

Application Method

One purpose of application calculations is to determine the maximum load conditions of a building. The se-

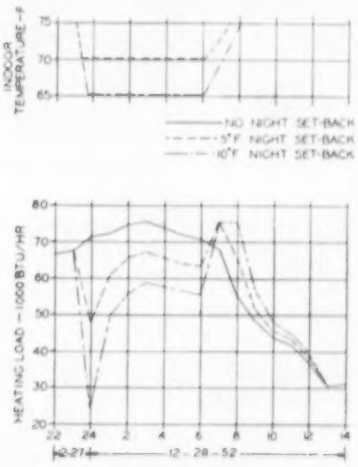

Fig. 14—Indoor temperature and heat load as functions of time and night setback, assuming ideal heating equipment controlled by ideal thermostat

lection of heating and cooling equipment is based on application calculations. Customer satisfaction depends

Table 6—Heat Load Application Equations. Loads in Btu per hour per square foot Region: New York, N.Y.

Construction	Load	Orientation	No Insulation	2 in. Min Wool Ins.	4 in. Min Wool Ins.
Frame Wall: Wood siding; Fir sheathing plus building paper $\frac{25}{32}$ in.; 2 x 4 in. studding; Gypsum lath $\frac{3}{8}$ in.; plastered, $\frac{1}{2}$ in.	Cooling	North	21.86-0.242 T_i		
		East	22.20-0.242 T_i		
		South	25.10-0.242 T_i		
		West	24.19-0.242 T_i		
	Heating	—	4.04-0.242 T_i		
Pitched Roof — Ceiling[a]: Asphalt shingles; fir sheathing plus building paper $\frac{25}{32}$ in.; 2 x 6 in. rafters; Attic air space naturally ventilated; 2 x 6 in. joists; Gypsum lath $\frac{3}{8}$ in.; plastered, $\frac{1}{2}$ in.	Cooling	—			3.37-0.0293 T_i
	Heating	—			0.52-0.0293 T_i
Floor over Basement[a] (entirely below ground): Hardwood $\frac{13}{16}$ in.; building paper; subflooring, $\frac{25}{32}$ in.; 2 x 8 in. joists; Basement wall 12 in. cement blocks; Floor 3 in. concrete.	Cooling	—	13.31-0.238 T_i		
	Heating	—	13.31-0.238 T_i		
			No shades	Venetian blinds drawn	Awnings
Windows: Single pane	Cooling	North		65.15-0.701 T_i	
		East		65.15-0.701 T_i	
		South		115.6 -0.701 T_i	
		West		170.9 -0.701 T_i	
	Heating	—		10.51-0.701 T_i	
			$\frac{1}{2}$ Air Change/hr[b]	$\frac{1}{4}$ Air Change/hr[b]	1 Air Change/hr[b]
Infiltration[a] Windows = 25 percent of wall area	Cooling	—	9.94-0.108 T_i		
	Heating	—	4.81-0.302 T_i		

[a]Load in Btu/hr per sq ft of floor area.
[b]Minimum rate of air changes.

largely on proper sizing of the equipment.

It is believed that the user can be served best if the load calculations are exact and the possibility of errors is kept to a minimum. Load calculations which are based on actual weather data (*i.e.* temperature, solar radiation and wind conditions), and which account properly for the thermal transient characteristics of the structures, offer the greatest opportunity for success. If the calculations are reasonably simple the margin of error will also be reasonable.

The thermal response method makes possible a uniquely superior application method. The calculations are based on actual weather data, and transient characteristics of structures are included in the response factors. It seems to be logical to develop regional tables of heat load factors for the commonly used constructions. These factors incorporate both weather conditions and the transient characteristics of the structure. Expressions similar to equations 1 and 2 can be reduced, for application purposes, to the form:

$$Q = (a - bT_i)\ A \quad \ldots\ldots\ldots (6)$$

where

Q = heat load of structure (such as individual walls, roof).
A = area of structure perpendicular to heat flow.
T_i = design indoor temperature.
a and b = Factors typical for structure and weather conditions of the region.

Values for the parenthetical portion of Equation 6, called *application equations* for short, have been calculated for the construction details of the house used as an example throughout this study. The factors incorporate the weather conditions which produced the peak loads of the sample calculations. For future application equations it would be advisable to study weather data of a number of years to find the true extremes. Table 6 is a sample table of application equations which could be published in a handbook.

Another possibility would be to solve the equations for typical design indoor temperatures and to list regional load factors in tables of handbooks. Table C-1 in Appendix C is an example.

In the field it would be desirable to have a simple form sheet. Table 7 is a sample of a form sheet for load calculations by the thermal response method. The example included there is again the sample house. Areas are multiplied by the corresponding load factors which would be taken from sources like Table 6 or Table C-1. Columns are then added vertically to give total loads.

Table 7—Form Sheet for Heat Load Calculations
Location: New York. N. Y. Indoor Temperature: 75 F

			Area, sq ft			Factor Cooling	Cooling Load	Factor Heating	Heating Load
Walls	N	Gross Wall	482	——	——	——	——	——	——
		Window	——	176	——	12.57	2200	——	——
		Net Wall	——	——	306	3.71	1130	——	——
	E	Gross Wall	329	——	——	——	——	——	——
		Window	——	12	——	12.57	150	——	——
		Net Wall	——	——	317	4.05	1280	——	——
	S	Gross Wall	485	——	——	——	——	——	——
		Window	——	146	——	63.00	9200	——	——
		Net Wall	——	——	339	6.95	2350	——	——
	W	Gross Wall	328	——	——	——	——	——	——
		Window	——	50	——	118.34	5900	——	——
		Net Wall	——	——	278	6.04	1680	——	——
	Total	Window	——	384	——	——	——	−42.07	−16200
		Net Wall	——	——	1240	——	——	−14.11	−17500
Roof		Floor	1800	——	——	1.17	2100	−1.68	−3020
Floor		Floor	1800	——	——	−4.54	−8150	−4.54	−8150
Infiltration		Floor	1800	——	——	1.84	3310	−17.84	−32100
						Total sens Cooling:	21150	Total Heating:	−77170

Conclusions

The *thermal response method* described here has a number of unique features which make it appear superior to other methods of heat load calculation:

1. A high degree of accuracy is reached by the use of actual weather data (temperature, solar radiation and wind conditions) as recorded by the U. S. Weather Bureau. Selection or assumption of outdoor conditions is avoided.

2. A high degree of accuracy is made possible by utilizing experience from electrical analogue studies and by representing thermal transients of structures by sequences of response factors.

3. The method is practical for engineering and application purposes because calculations using response factors can be made by hand, by desk calculators or by digital computers as available in accounting departments. Response factors have permanent value and may be made available through handbooks.

4. Transient temperature variations of indoor air as a result of capacity changes or control setting can also be calculated by using appropriate response factors.

5. A simple application method can be developed which will avoid the customary dependence on outdoor *design temperatures* and other experience factors.

Acknowledgment

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The President's Page

Codes and Standards

Codes and Standards was one of the primary subjects that created considerable discussion at the Society Chapter Regional Committee meetings which have just been completed in the seven geographic areas throughout our country and Canada.

Members and alternates in attendance at these committee meetings wondered why the Society in recent years had not taken a more aggressive and dominant position in the development of Codes and Standards. Unless our Society has a cooperating enforcement agency to lend support to either a safety, testing or rating code, it was explained at these meetings that properly prepared standards are rarely used because of the difficulty of obtaining compliance. However, it was explained that our Society has a responsibility in preparing model codes for such structures where proper heating, ventilating and air-conditioning requirements are to be maintained, and where such standards may be used as a guide in the preparation of local codes.

Part of the answer was also found in the fact that several of the trade associations in this field had taken an active interest in recent years in developing, testing and rating codes, and that in their cases compliance could be obtained because of group action of the participating interests.

At these meetings it was mentioned that the Society has a very active Standards Committee which supervises, directs and coordinates these activities. Society committees are currently concerned with testing and rating codes for heavy duty furnaces for gravity-type roof ventilators, for unit ventilators, for return-line low-vacuum heating pumps and for evaporative coolers. Additionally the Standards Committee has Society representatives serving on 16 projects which are operating under ASA procedures. Also the Committee has representatives on 4 ASTM projects; 4 on similar committees of National Fire Protective Association; and 1 representative on a project of American Concrete Institute. There are also 2 committees engaged in projects which are joint with ASRE. It will thus be seen that on a national basis the Society is engaged in a wide range of codes and standards activities.

Because we have been extremely cautious in advising chapters to be careful in not participating in code making activity at the municipal or state level which might be construed to influence legislation, the chapter representatives expressed a desire for clarification.

A reference to the By-Laws of the Society discloses that we are chartered "To advance the arts and sciences of heating, ventilating, cooling and air conditioning — to promote the unrestricted dissemination of knowledge — to cooperate with governmental agencies — for the benefit of the general public."

Chapters may be invited by local or state government agencies to participate as a group activity or preferably by the appointment of individual chapter members to a Code or Standards Committee for consultation and advice. The purpose of such an activity should be to furnish technical knowledge which will assist in the preparation of safety or acceptable minimum installation standards governing the selection of heating, ventilating and air-conditioning equipment for the primary purpose of promoting the interests of the public welfare.

Chapters are cautioned not to become involved in any individual or group activity where the purpose is to influence legislation either for the benefit of the industry or any member or group of the profession.

John W. James

President
American Society of Heating and Air-Conditioning Engineers

Awnings and Air Conditioning

The trend to residential cooling has caused a new interest in awnings. Canvas and metal awning manufacturers are now gearing their sales appeals to the rising popularity of summer air conditioning, because awnings can reduce the amount of heat entering a building by shading the glass areas.

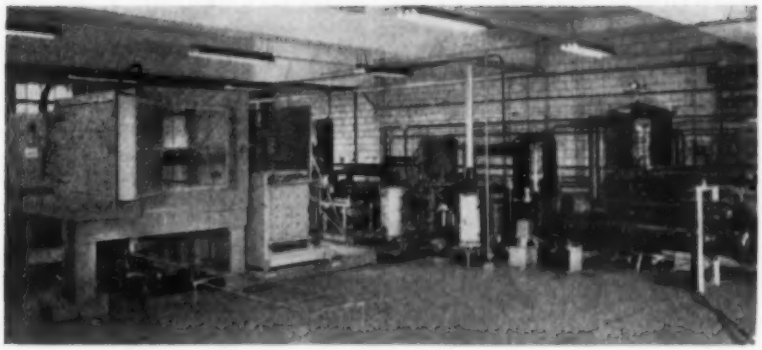
How much solar heat do awnings prevent from entering windows? How much air-conditioner capacity and power consumption will awnings save an owner? In other words, *How much?* At the present state of the art, only approximate indications of quantitative results are known. For example, the HEATING, VENTILATING, AIR CONDITIONING GUIDE 1956 indicates that the use of awnings reduces the heat gain through windows by 65 to 75 percent. There are so many different types of awnings today, ventilated and unventilated, with various amounts of projection, that more design data are needed. Where the awnings do not completely shade the window at all times of the day, as is often the case, the amount of heat kept out by the awnings will be variable. Strictly speaking, the shading effect will vary hour to hour as the sun angle and sky changes.

The ASHAE Research Laboratory is planning to conduct necessary research to establish a more complete guide for calculating the shading effect of metal and canvas awnings during the summer of 1956. Sponsorship for the program on canvas awnings has been provided by the *Canvas Awning Institute* and the *National Canvas Goods Manufacturers Association.* Support for the study of metal awnings is being provided by individual manufacturers, distributors, and dealers in that industry through the cooperation of the *National Metal Awning Association.* The *NMAA* has an air-conditioning committee headed by J. D. Lane of Fort Worth, Tex.

The project is to make use of the solar calorimeter at the Research Laboratory in Cleveland, Ohio, where the Btu transfer through glass shaded by awnings can be measured directly. R. G. Huebscher will be in overall charge of the program, according to an announcement from the Laboratory. The solar calorimeter is the only one of its kind and has been used to determine the heat transfer through fenestration of many types over a period of years. An ultimate objective is the development of an *Awning Calculator* to be used for estimating the reduction in the heat load and power consumption as the result of using awnings.

One indication of the economic advantages of awnings has been provided to the awning industry by a firm of consulting engineers which supervised the installation of awnings on 14 typical buildings at a southern Air Force Base. Their findings show that 184 awnings reduced the equipment load by 27.2 tons of refrigeration, which was 11.2 percent of the cooling loads of the buildings. The saving of operating cost, maintenance, and charge-off of the non-installed equipment would be $3,469.60 per year, or a saving of $18.86 per awning.

A complete economic comparison would have to include the cost of the awnings as compared with other means for light control which would have been required had awnings not been used. The life expectancy of the awnings selected would also be a factor. Nevertheless, the foregoing figure gives some indication of the merits of awnings when used in conjunction with air conditioning. As the results of further research become available, it will be possible for air conditioning engineers to make more accurate estimates of loads and performance. In cooperation with awning distributors, purchasers will have access to the full story and can make a reasoned selection of both air conditioners and awnings.



FIRST RESULTS REPORTED FROM HUMAN CALORIMETER

The ASHAE Laboratory spent some 7 years on the design and construction of the human calorimeter at Bethesda, Md. This calorimeter is located at the *Naval Medical Research Institute* where it occupies a two-floor building.

Although completed in 1955, results of the first physiological observations were not reported until recently. The occasion was a paper prepared by Comdr. David Minard, Dr. T. H. Benzinger and Charlotte Kitzinger. This paper was presented at a meeting of the *Federation of American Societies for Experimental Biology* at Atlantic City on April 20.

The fact that these early observations have been reported is of interest to many members beyond their usual meaning since the calorimeter was designed and constructed as a Society research project. Work was done under the direction of the Technical Advisory Committee on Human Calorimetry which at the time of the dedication of the calorimeter was composed of: G. L. Tuve, chairman; R. S. Dill, Nathaniel Glickman, J. D. Hardy, E. R. Queer, L. E. Seeley, T. H. Urdahl and C. P. Yaglou. R. G. Huebscher of the Laboratory staff was in charge of design and construction.

An indication of the type of data which may be obtained from the calorimeter can be formed by considering the nature of the early data presented in the paper just mentioned.

A subject rested prone on a light metal frame and (1) exercised by using a spring expander, (2) changed posture by curling up instead of lying straight out, and (3) breathed rapidly. As each of these maneuvers was going on, the heat load from the subject was continuously recorded. The air in the calorimeter was kept at 85 F (29.5C), 30 percent relative humidity, and 800 liters per minute of air flow.

During exercise for 3 2/3 min, heat output rose and then dropped rapidly for 5 min as the subject returned to normal, then dropped step by step to the resting level. During exercise and recovery, 95 percent of the excess heat was evaporative.

During the rapid breathing maneuver also, a major part of the excess heat was evaporative, but during recovery, the rate of drop to resting level was a smooth curve instead of being stepped.

When the subject changed posture by curling up, there was a prompt drop in the heat output measured in the main chamber, as the subject presented a reduced radiative surface in that posture. Heat stored by the subject promptly reappeared when he resumed the extended position.

MEMBERS SPEAK AT WARM AIR CONFERENCE

The program of the First Technical Conference sponsored by the *National Warm Air Heating and Air Conditioning Association* was held May 24-25, 1956 at the Edgewater Beach Hotel in Chicago.

The program at the Conference included 10 papers on technical subjects of interest to members of the Association. Included among the speakers who prepared papers for the Conference were: D. R. Bahnfleth,

F. J. Nunlist, Jr.

Urbana, Ill.; R. H. Combs, Tulsa, Okla.; Prof. M. K. Fahnestock, Urbana, Ill.; Dr. S. F. Gilman, Syracuse, N. Y.; Prof. A. L. Hesselschwerdt, Jr., Cambridge, Mass.; Dean L. G. Miller, E. Lansing, Mich.; J. R. Wright, Urbana, Ill.

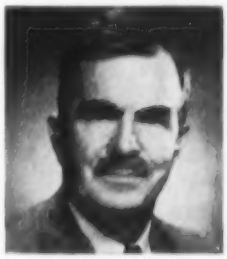
In addition to the authors' papers, two other Society members were prominent in the Conference. F. J. Nunlist, Jr., Milwaukee, Wis., was the moderator, and the Conference was under the general direction of H. T. Gilkey, Cleveland, Ohio, technical secretary for research of the Association.

Attendance at this First Technical Conference reached about 200.

ASHLEY HEADS *ASRE*

With a program featuring three concurrent technical sessions and conferences, the *ASRE* held its 52nd Annual Meeting at Cincinnati on June 2 to 6, 1956.

Installed as president, C. M. Ashley, chief staff engineer, Carrier Corp., Syracuse, N.Y., is a longtime (25 years) mem-



C. M. Ashley

ber of ASHAE. Mr. Ashley has served as a member of ASHAE Council (1943-1946) and as chairman of the Society's Committee on Research (1943). He currently is a member of the Technical Advisory Committee on Sound and Vibration Control. Mr. Ashley's elevation to the presidency of *ASRE* follows his service as first and second vice president and treasurer of that society, and as chairman of many of its most important committees.

Other ASHAE members installed in office at the meeting were Cecil Boling as second vice president; D. D. Wile, as treasurer; and E. P. Palmatier, John Engalitcheff, Jr. and R. G. Werden as directors. Representing the Society at the meeting was Pres. John W. James.

HONORED BY LIFE MEMBERSHIP

Byron L. Casey, Chicago, Ill.—Presently midwest district sales manager and a member of the board of directors, Ilg Electric Ventilating Co., Mr. Casey has been connected with their Chicago sales office for the past 38 years. Previously he had worked with the Northern States Power Co., Minneapolis, and Commonwealth Edison Co., Chicago.

His home town is Van Buren, Ark. He attended Chicago public schools, Lewis Institute and DePaul University, Chicago.

Journal Section

Since Mr. Casey joined the Society in 1921, he has served on various Illinois Chapter committees. He has written articles on ventilation for publication.

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Herbert J. Church, Toronto, Ont.—For the past 35 years, Mr. Church has acted as manager of the Toronto office, Darling Bros., Ltd. A member of the Society since 1922, he was elected president of the Toronto Chapter, 1930. He also served as vice president and member of the board of governors of the Ontario Chapter, as well as a member of the Society's Nominating Committee, 1931.

Born in Bristol, England, Mr. Church was graduated from the Merchant Venturers Technical College, now affiliated with the University of Bristol. He then spent 3 years as a student with the Central Engineering Works, Bristol.

Moving to Canada in 1907, he became associated with the Grand Trunk Railway, Montreal, and Fairbanks-Morse Co., Toronto. In 1911 he entered the sales department of Darling Brothers, Ltd.

Mr. Church is a member of the *Association of Professional Engineers* and the Engineers Club of Toronto. He has also been affiliated with the *Institute of Mechanical Engineers*, England. One of the organizers of the Weston Golf and Country Club, he served as its first president in 1916.

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Irvin H. Geiger, Harrisburg, Pa.—The owner of his own business since 1922, Mr. Geiger recently formed a partnership, with W. C. McLain as junior partner. The new name of the company is Irvin H. Geiger Associates.

A native of Harrisburg, Pa., Mr. Geiger was graduated from Harrisburg Technical High School and furthered his studies with the Alexander Hamilton Institute, New York, N.Y. For 10 years beginning in 1910 he assisted Robert Ross Jones, consulting engineer, Harrisburg. Mr. Geiger then spent 2 years as sales representative for the Alexander Hamilton Institute.

His affiliations include the *National Society of Professional Engineers* and *The Pennsylvania Society*. He has served as president of the Harrisburg Lions' Club; Harrisburg Chapter, *Pennsylvania Society of Professional Engineers; Engineers Society of Pennsylvania;* and as director, Harrisburg Chamber of Commerce.

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Harry L. Janet, New York, N.Y.—Engaged in the engineering department, Buensod-Stacey, Inc., New York, N.Y., Mr. Janet holds the office of vice president.

Mr. Janet, who was born in New York, N.Y., received his preliminary education and training in engineering and machine design from Pratt Institute. Following a few brief connections as a draftsman and plant engineer with R. Hoe & Co., New York Telephone Co. and E. W. Bliss Co., New York, he entered the air-conditioning field in 1911, when he joined the engineering department of the Carrier Air Conditioning Co. He was still with them in 1914 when the Carrier Engineering Corp. was formed. Mr. Janet continued his association with the Carrier Engineering Corp. until 1936 when he transferred to Buensod-Stacey, Inc.

In addition to heating and ventilating, he has specialized in humidifying, dehumidifying and drying.

Milton S. Wunderlich, St. Paul, Minn.—Currently director of research, Minnesota & Ontario Paper Co., Minneapolis, Minn., Mr. Wunderlich has held this position since 1945. He had previously served the company in its European operation, and has held the post of assistant resident manager, International Falls, Minn., and general sales manager, Insulite Division.

Active in Society affairs, he was a member of Council, 1946-48. He served as chairman of the Standards Committee from 1947 to 1948, and of the Nominating Committee in 1954. Participating also in Minnesota Chapter activities, he held the office of secretary-treasurer, 1929, and was a member of the board of governors, 1930.

A native Minnesotan, Mr. Wunderlich was born in Faribault. He received his B.S. in mechanical engineering from the University of Minnesota in 1919 and his M.E. in 1920. While at the University, he also did fellowship work and conducted research for the Society. Upon graduation, he joined the Flaxlinum Insulating Co., St. Paul, where he rose to the position of chief engineer and assistant to the president. He became associated with the Minnesota & Ontario Paper Co. in 1932.

Mr. Wunderlich is a registered engineer and holds membership in *ASME, ASTM, Forest Products Research Society* and Kiwanis Club.

M. S. Wunderlich receives his Certificate of Life Membership in the Society from E. T. Erickson, president of Minnesota chapter, at its May meeting

B. L. Casey
Chicago, Ill.

H. J. Church
Toronto, Ont., Canada

I. H. Geiger
Harrisburg, Pa.

H. L. Janet
New York, N.Y.

Chapters Regional Committee Meeting Held in Hartford

The first meeting of the Chapters Regional Committee for Region 1 took place at the Hotel Statler in Hartford, Conn., on Thursday, May 24. The Regional Director, John Everetts, Jr., Philadelphia, Pa., opened the meeting at 9:40 a.m. Present were all the Society Officers, *viz*: Pres. John W. James, Chicago, Ill.; First Vice Pres. P. B. Gordon, New York, N. Y.; Second Vice Pres. E. R. Queer, University Park, Pa.; and Executive Secretary A. V. Hutchinson, New York, N. Y. Mr. Everetts introduced each of the Officers in turn and also R. C. Cross, New York, N. Y., Secretary *ASRE*. Pres. Walter Heywood of the host Connecticut Chapter expressed the pleasure of that chapter at having the committee meet in Hartford.

Members and alternates representing the several chapters of Region 1 were present as follows: E. J. Hoagland and Walter Heywood, member and alternate from Connecticut Chapter; C. H. Smith and W. C. Kruse, Jr., member and alternate from New Jersey Chapter; L. A. Childs, member from Central New York Chapter; L. V. Appleby and M. E. Waddell, member and alternate from Empire State Capital Chapter; J. E. Schechter and Albert Giannini, member and alternate from New York Chapter; Van Ness Harwood, alternate from Western New York Chapter; E. K. Wagner and P. H. Yeomans, member and alternate from Philadelphia Chapter; and R. M. Toucey, member from Pittsburgh Chapter.

As a first item of business, E. J. Hoagland was unanimously elected as committee secretary.

Following this, Pres. John W. James addressed the committee on the subject *Our Society and its Future*, telling of the development of the Society's research programs, and of the Society publications. He also included his views concerning probable membership increases, both on a regional and on a national basis, as well as what he sees in the future as a result of an expanded membership.

In presenting the *Philosophy of the Regional Plan of Chapter Operations*, First Vice Pres. P. B. Gordon

John Everetts Jr.
Philadelphia, Pa.

explained how this began in 1947 and evolved through 8 years of work by various committees with the final Regional Plan becoming effective under the new By-Laws of the Society on January 25, 1956. In his discussion he stated the Society's objectives, explained the mechanisms that permit it to accomplish its purposes and gave a detailed analysis of the Regional Plan of Chapter Operations.

At the noon luncheon session, where E. J. Hoagland, Hartford, Conn., served as toastmaster, second Vice Pres. E. R. Queer gave a most interesting talk on *Engineers and Their Relationship to People*. All the officers of the host Connecticut Chapter were present at the luncheon meeting and were presented by the toastmaster: Walter Heywood, president; Fritz Honerkamp, vice president; Joseph Pierce, treasurer; and R. B. Cahoon, secretary.

At both the morning and afternoon sessions, much time was devoted to discussions of various topics of especial interest to the chapters, including codes and standards, improvement of Society publication practices, chapter membership development, sources of chapter dues, and development of new chapters.

At the afternoon session, a feature was a panel discussion of chapter problems, presided over by First Vice Pres. P. B. Gordon, with G. D. Fife, Massachusetts Chapter, and Albert Giannini as panel members. The panel members discussed *Financing Chapter Meetings* and *Programming and Speakers* respectively.

As an executive item of business, the committee elected a member and two alternate members to serve on the Nominating Committee for 1957.

An invitation was extended by the Empire State Capital Chapter for the Chapters Regional Committee to hold the 1957 meeting in Albany. This invitation was unanimously endorsed by the delegates and will be referred to the Regions Central Committee.

In the evening following adjournment of the meeting of the Chapters Regional Committee, many of the delegates attended the regular meeting of the Connecticut Chapter held at Club Alden in Hartford. At the chapter meeting, President James gave a very interesting talk on *Humanity Benefits from Air Conditioning*.

SUMMARY OF CHAPTER MEETINGS*

• *ARIZONA*: At the beginning of the April meeting, Pres. W. A. Biddle appointed a tellers committee, consisting of J. S. Blackmore, J. P. Sorenson and F. A. Anderson. Before the meeting was over, the tally had been counted and the new officers were announced as follows: *President*—J. B. Hoaglund; *Vice President*—E. P. Maxwell; *Secretary*—F. W. Gabbard; and *Treasurer*—G. L. Jackson, Jr.

J. H. Futrelle, district representative, The Coleman Co., Inc., Los Angeles, conducted the program for the evening, an interesting talk and motion picture on

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Journal Section

gas engine refrigeration machinery. Attendance 31.

• *ARKANSAS*: Industrial relations among architects, engineers, contractors and salesmen were treated by a panel of speakers at the April meeting. Representing various points of view, intragroup responsibility was covered: for the architect, by Howard Eichenbaum, of the firm of Erhart, Eichenbaum, & Rauch; for the engineer, by E. N. Pettit, senior partner, of the firm of Pettit & Pettit, Consulting Engineers, Little Rock, Ark.; for the general contractor, by Werner Knoop, representing the Baldwin Co.; for the mechanical contractor, by J. S. Binder, executive vice president and general manager, Pfeiffer Plumbing & Heating Co., Little Rock; and for the manufacturer's representative, by J. L. Brown, owner, J. L. Brown Sales Co., Little Rock. Each member of the panel outlined his responsibility to each of the others, and to the owner. Vice Pres. J. W. Thompson acted as moderator for the question and answer period following. There was a thorough discussion of plans and specifications, with emphasis on the term *or equal*.

Pres. J. L. Brown appointed Mr. Pettit, Herman Cumnock and R. E. Blaylock as a nominating committee. Attendance 30.

• *ATLANTA*: V. F. Self, regional manager, Anemostat Corporation of America, New York, N.Y., addressed the chapter on *High Velocity Air Distribution* at the meeting in April.

Pres. T. A. Barrow, Jr., called upon W. M. Garrard, chairman of the nominating committee, to give a report. Nominations were closed following Mr. Garrard's reading of the committee's slate and a call for nominations from the floor. Attendance 130. Attendance ratio 0.31.

• *BATON ROUGE*: A talk on *A Plant Growing Laboratory at California Institute of Technology* was given in April by A. J. Hess, member of Council, and president, Hess-Greiner & Polland, Los Angeles, Calif. His introduction was made by C. B. Gamble, also a member of Council. Mr. Hess was given a standing ovation after his talk.

Pres. C. S. Woodruff appointed an auditing committee, composed of D. W. Chesson, W. I. Pol and C. B. Morgan. Attendance 33. Attendance ratio 0.48.

• *BLUEGRASS*: The use of vibration isolation bases on mechanical equipment was demonstrated at the April meeting by D. H. Vance, vice president and executive engineer, The Korfund Co., Inc., Long Island City, N.Y. Mr. Vance entitled his talk *Vibration and Noise Control for Air-Conditioning Equipment*.

K. P. Vinsel, Jr., listed the nominating committee's selection of a slate of candidates. Pres. W. M. Pace reported on the Toledo and Atlanta regional meetings.

• *BRITISH COLUMBIA*: Vice Pres. D. W. Thomson, presiding at the April meeting, read the list of nominees for office.

The guest speakers for the evening were introduced by R. D. McDonnell, program chairman. The first speaker, Ted Crosby, president, North American Weather Consultants, gave a brief talk serving as an introduction for the second speaker, Robert Elliott, a meteorologist. Mr. Elliott traced the development of basic cloud seeding principles, for the production of rain and the suppression of hail and lightning. A resident of Santa Barbara, Calif., Mr. Elliott explained in detail the reason for extended smog conditions in the Los Angeles area and outlined the steps being taken by authorities in the science of pollution control. Attendance 49. Attendance ratio 0.48.

• *CENTRAL NEW YORK*: Accompanying a talk given in April on the computer for use in airplanes, a motion picture and a scale model of a B-52 aircraft were shown. The speaker was C. D. Johnson, general manager, Airborne Computer Laboratories Military Products Division, International Business Machines Corp., Endicott, N.Y., introduced by L. E. St. John. Pres. L. A. Childs thanked Mr. St. John and the committee for arranging a splendid program.

Elections held at the meeting gave the following results: *President*—H. J. Morton; *Vice President*—Merle Weninger; *Treasurer*—S. F. Gilman; *Secretary*—E. L. Moyer; *Board of Governors*—D. J. Girard and R. A. Barr. Attendance 51.

• *CONNECTICUT*: Previous to the April meeting, the members enjoyed an inspection tour of the Hull Brewery, New Haven, with a discussion of the brewing process given by Messrs. Reynolds and Grandjean.

At the business meeting, A. L. Otis reported for the tellers committee the unanimous election of the following: *President*—Walter Heywood; *Vice President*—Fritz Honerkamp; *Treasurer*—J. D. Pierce; *Secretary*—R. B. Cahoon; *Board of Governors*—E. J. Hoagland, F. J. Raible, Jr., and J. O. Ostberg. Retiring President Hoagland presented the gavel to the new president, Walter Heywood.

• *DELTA*: E. H. Sanford, technical papers chairman, introduced A. J. Hess, member of Council, who addressed the members and guests assembled for the April meeting. Mr. Hess, president, Hess-Greiner & Polland, Los Angeles, Calif., received a rising vote of thanks for his interesting talk on *The Heat Pump*. Pres. W. B. Martin, Jr., was the presiding officer. Attendance 55.

• *GOLDEN GATE*: The application of dichlorodifluoromethane 22 to single-stage and two-stage compound refrigeration systems was discussed in April by Norman Sharpe, head, Refrigerating and Air-Conditioning Department, California State Polytechnic College, San Luis Obispo, Calif.

Eric Roberts reported for the nominating committee. Pres. D. E. McLeod was in the chair. Attendance 77.

• *ILLINOIS*: Pres. G. G. Freyder presented the Life Membership certificate for B. L. Casey to A. C. DeSmet, since Mr. Casey was unable to attend the April meeting.

The program chairman for the evening, Henry Seetch, Jr., introduced John Thomas, Dow Corning Corp., Midland, Mich. Mr. Thomas described a silicone type of material which is effective as a polisher, water repellent, lubricant, defoamer, protective coating, and insulator.

P. J. Marschall (right) and H. G. Gragg, general chairman and vice chairman, Committee on Arrangements, meet to discuss plans for the 63rd Annual Meeting of the ASHAE to be held in Chicago, February 1957

• *INDIANA*: An illustrated talk on the use of diffusers was given in April by H. H. Yousoufian, research engineer, Air Devices, Inc., New York, N.Y. Following his introduction by W. L. Kercheval, Mr. Yousoufian covered various types of diffusers: strip line, circular ceiling, square and rectangular, and combination supply and return. He concluded his talk by outlining field testing procedure using the hot-wire rotating vane, and deflector type vane anemometer.

Pres. J. W. Jackson noted highlights of the regional meeting held in Toledo. Attendance 79.

• *INLAND EMPIRE*: Many interesting facts pertaining to gas burners and their application were brought out at the April meeting by Ed Snook, Webster Engineering Co., Division of Surface Combustion Corp., Tulsa, Okla. In his informative talk, Mr. Snook, who was introduced by H. A. Steele, discussed gas burner design and control, varying types of burners, and application to new and old installations.

Pres. F. W. Jenkinson conducted a general discussion on the Annual Meeting 1956. Attendance 39. Attendance ratio 0.52.

• *IOWA*: A Junior Member of the Society, R. W. Flanagan, sales engineer, Conditioned Air Corp., Des Moines, Ia., gave a short talk in April on *Economic Analysis of Ownership and Operating Cost of Air Conditioning an Office Building*. Using a large chart to tabulate his data, Mr. Flanagan described a system for a 300,000 sq ft building, with costs reduced to a per square foot, per ton, and per person basis.

D. E. Schroeder introduced Robert Elford, Records Division, U. S. Weather Bureau, Des Moines. Mr. Elford discussed Weather Bureau services available to the engineer, aspects of heating and cooling degree-days, and long-time climatic changes. He concluded with the showing of a film entitled *Tornado*. Attendance 46. Attendance ratio 0.38.

• *KANSAS CITY*: At the request of Pres. A. S. Hurt, Jr., M. K. Rush introduced the speaker at the April meeting, J. W. May, technical director, Air Filter Division, American Air Filter Co., Inc., Louisville, Ky. Mr. May held the close attention of his audience during his address on the *Selection and Application of Air Filters*. His coverage of the subject was so thorough that few questions were asked.

Vice Pres. R. M. Spencer announced the holding of the regional meeting in Omaha, and F. K. Ladewig explained how members of Council are nominated. An unqualified endorsement for R. W. Tobey for Council membership was voted by the Chapter. The nominating committee chairman, P. C. Leffel, listed the nominees for chapter offices. Attendance 75. Attendance ratio 0.24.

• *MANITOBA*: Following the presentation of the nominating committee's selections for 1956-57 officers given by the chairman, G. T. Christie, Pres. G. C. Davis thanked the present officers for their support during his year in office. Secy. A. H. Millar reported on the regional meeting in Toronto.

The speaker, H. E. Voegeli, development engineer, The American Brass Co., Waterbury, Conn., was introduced by A. K. Piercy. Mr. Voegeli's unusual talk was on *Stored Solar Heat and the Heat Pump*. Attendance 32. Attendance ratio 0.63.

• *MEMPHIS*: *Air Conditioning of Plants* was treated at the April meeting by A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, Calif. Mr. Hess, who was introduced by Program Chairman W. L. Henson, is a member of Council and director of Region 4. He noted the importance of plant study to engineers, describing photosynthesis as a source of food and energy. Design features of the photosynthesis laboratory at California Institute of Technology were depicted.

At this meeting presided over by Pres. John Hilton, II, officers for 1956-57 were announced as follows: *President*—W. L. Henson; *Vice President*—R. H. Bolding; *Secretary*—G. B. Ramsey, Jr.; and *Treasurer*—R. L. Elbrecht. Attendance 25. Attendance ratio 0.33.

• *MICHIGAN*: Fourteen past presidents attended the April meeting of the Michigan Chapter. After dinner, Pres. D. S. Falk introduced his predecessors in office.

The guest speaker, R. D. Lemmerman, vice president, Industrial Sound Control, Inc., a division of Koppers, Inc., elaborated on the *Treatment of Noise in Air-Conditioning Systems*. Attendance 72.

• *MINNESOTA*: An election held at the April meeting brought the following results: *President*—E. T. Erickson; *Vice President*—F. G. Vogt; *Secretary*—J. H. Jester; *Treasurer*—R. G. Gridley; *Board of Governors*—G. M. Brown and M. E. Quigley. The new editorial staff will be: *Editor*—R. W. Gish; and *Assistant Editor*—T. R. Turnham.

Pres. J. S. Locke presented the speaker, C. S. Stock, manager, Herman Nelson Unit Ventilator Sales, American Air Filter Co., Inc., Louisville, Ky. He gave an interesting discussion on the Super Test School—The Washburn School, Auburn, Me. Attendance 111.

• *MISSISSIPPI*: Vice Pres. J. W. Doggett, Jr., introduced the April speaker, V. H. McBride, who gave a stimulating talk on the *Application of Package Liquid Heating and Cooling Equipment to Residential and Small Commercial Work*. Pres. B. L. Palmer presided. Attendance 24.

• *MONTREAL*: R. J. Ker, retiring president, made a brief report in April outlining Chapter activities during his term of office. With regret, he announced that Douglas Shand, a long-time member of the chapter had died.

The installation of the new chapter officers was conducted by D. L. Lindsay, member of the board of governors. Those who will serve for 1956-57 are: *President*—S. R. Plamondon; *Vice President*—W. E. Jarvis; *Secretary*—A. A. DeBreyne; *Treasurer*—Paul Thibault; *Board of Governors*—R. J. Ker, W. C. Hole, H. G. S. Murray, B. J. Horsburgh and G. N. Martin. President Plamondon expressed appreciation for Mr. Ker's fine job as president, and presented him with a past president's button and a suitably engraved gavel to commemorate the occasion.

After a brief recess, G. N. Martin introduced C. S. Stock, manager, Herman Nelson Unit Ventilator Sales, American Air Filter Co., Inc., Louisville, Ky. In a forceful, thorough discussion, *The Need for Good Thermal Conditions in the Classroom*, Mr. Stock emphasized that student performance varies with classroom temperature environment and that controlling the temperature of a classroom during the period of occupancy is essentially a cooling problem. Mr. Stock handled his subject with skill that comes from long experience in the field. Attendance 93. Attendance ratio 0.23.

• *NEBRASKA*: *High-Temperature Hot-Water Heating* was discussed at the April meeting by C. A. Carter, assistant chief technical secretary, Military Branch Engineering Division, Omaha District, Corps of Engineers, Omaha, Neb. Mr. Carter was one of 8 past presidents of the chapter at this meeting. E. N. Seiler was program chairman and Pres. T. E. Davis presided. Attendance 39.

• *NEW YORK*: Current research projects were described in April by E. R. Kaiser, director of research, ASHAE Research Laboratory, Cleveland, Ohio. Mr. Kaiser, who was introduced by Program Chairman J. B. Hewett, gave a highly encouraging report of the support being given to Society research.

At this annual meeting of the chapter, the report of the tellers of election was read by E. H. Munier as follows: *President*—J. B. Hewett; *Vice President*—C. R. Hiers; *Treasurer*—W. M. Heebner; *Secretary*—Carl H. Flink; *Board of Governors*—L. D. Carr, W. O. Huebner, J. M. Levy, W. J. Olvany and Albert Giannini. President Giannini announced that a committee consisting of R. A. Wolff, chairman, Ernst Graber, C. R. Hiers and J. B. Hewett had been appointed to select a new meeting place.

As suggested by the membership committee, appointment was made of a special committee to consider an educational program designed to be helpful to young engineers in the field. J. M. Levy, P. A. Bourquin, H. H. Bond, J. E. Schechter, C. R. Hiers and President Giannini are the members of the committee who are considering the possibility of conducting lectures, symposiums and seminars as a means of taking advantage of the experience of older chapter members. Attendance 60. Attendance ratio 0.13.

• *NORTH JERSEY*: By unanimous approval, new officers were elected at the May meeting as follows: *President*—W. C. Kruse, Jr.; *Vice President*—M. C. Christesen; *Secretary*—S. H. Nitzberg; *Treasurer*—L. G. Huggins; *Board of Governors*—H. P. Morehouse, C. W. Zimmer, C. E. Parmelee and C. H. Smith.

M. I. Levy, president, Viking Air Conditioning Corp., Cleveland, Ohio, gave a stimulating talk on *Warm Air Perimeter Heating*. After a lengthy discussion, the meeting was adjourned. Attendance 72.

• *NORTH TEXAS*: Pres. H. G. Gregerson, presiding at the April meeting, introduced as guests, A. B. Carter,

Journal Section

ASHAE member and president of the *Mechanical Contractors Association* in the area, and his guest, Oliver Erickson, secretary of the same association. An announcement was made of the Student Engineers' Banquet to be held in April, and the following offered to act as sponsors: R. G. Lyford, C. D. Collins, E. T. Gessell, A. R. Hundley, Jr., G. A. Linskie, D. P. Maley, M. B. Peiser, W. R. Hopkins, A. B. Carter, B. W. Clark, J. D. Poythress, Oslin Nation, R. M. Kilpatrick and E. T. Keck, Jr.

G. H. Gregerson (left), president of the North Texas Chapter of ASHAE, chats with future engineer Fred Underwood and national AIME President Carl Reistle at the annual student dinner sponsored by the Engineers Club of Dallas on April 26, with ASHAE participating and sponsoring a number of the 260 high school seniors attending.

Upon the conclusion of business, a panel discussion was held on *Specifications*. The moderator was J. F. Roberts and the panelists were: Terrell Harper, architect; P. N. Vinther, engineer; W. E. Frost, contractor; and J. D. Poythress, manufacturers' representative. The responsibilities of and the interrelations between various contractors involved in building construction were discussed, and comparisons were made between open specifications and base bids. Panelists pointed out the general shortcomings of many specifications. The meeting adjourned after a lively discussion. Attendance 111. Attendance ratio 0.42.

• *NORTHEASTERN OKLAHOMA*: Pres. H. W. Meinholtz announced at the April meeting that J. C. Netherton, Jr., W. C. Roads, R. L. Sigler, L. T. Devero and J. D. Ryan had been appointed as a committee to work with the Architect's League. C. H. Dollmeyer, member, Chapters Regional Committee for Region 6, discussed his trip to the regional meeting at Dallas.

Two speakers covered the subject of water-to-water and air sink pump applications and performance. President Meinholtz introduced H. B. Edwards, Acme Industries, Inc., Jackson, Mich., and J. D. Shaw introduced Ralph Colby, Air Conditioning Division, General Electric Co., Bloomfield, N.J. Attendance 46.

• *NORTHERN ALBERTA*: Guests from Edmonton, Toronto and Winnipeg were welcomed at the April meeting by Pres. W. C. Woods. E. K. Cumming then reported on the Chapters Regional Meeting for Region 7, and described the organization of ASHAE as based on the new regional basis. Mr. Cumming said that delegates were very gratified by the splendid hospitality shown them by the Ontario Chapter.

President Woods then introduced members of a panel on *Automatic Control Systems—Why, Where, and How.* Taking part were W. D. Allen, Minneapolis-Honeywell Regulator Co., Ltd.; G. V. Greenwood, sales engineer, Cumming Galbraith, Ltd., Edmonton, Alberta; and John McBride, Johnson Temperature Regulating Co. of Canada, Ltd. The moderator for the discussion was W. L. Rootham, manager, Johnson Temperature Regulating Co. of Canada, Ltd.

Mr. Allen, in discussing the '*Why*' of automatic controls, stated the principle reason in the Comfort Control of air conditions was to increase efficiency in homes, schools, offices, and most importantly, in hospitals.

Mr. Greenwood, discussing '*Where*,' thought there were three physical requisites for automatic control systems: (1) Adequate equipment of correct design adequately installed, (2) Facilities for adequate maintenance and service of all equipment, and (3) Economic justification of the cost.

Mr. McBride, in discussing the '*How*' of the question, assumed the basic system in hospitals would be a high vacuum steam system using a basic control of the modulating type, with special areas controlled by the patients in those areas. He pointed out the problem of the control of preheat coils, and the need to provide ventilation and maintain a proper percentage of humidity.

The moderator, Mr. Rootham, summed up by saying that usually the simplest control proved the best — the individual room thermostat with individual coil and damper control.

R. A. Williams gave the vote of thanks. Attendance 47.

• *NORTHERN OHIO*: B. A. Schwirtz introduced S. T. Bowen, sales engineer, The Cleveland Electric Illuminating Co., Cleveland, Ohio, who spoke at the April meeting on the heat pump. Mr. Bowen reported on 22 local heat pump installations with low yearly operating costs.

H. R. Canoyer, member, Chapters Regional Committee for Region 2, reported on the regional meeting held in April. John Richmond, chairman, nominating committee, listed the proposed slate for 1956-57. Attendance 70.

• *NORTHERN PIEDMONT*: A joint ASHAE-*ASRE* meeting was held in April under the chairmanship, first of the *ASRE* chapter president, W. D. Graham, Jr., and later by ASHAE chapter president, L. R. Gorrell. Announcements were made by both presidents.

After the business meeting was ended, T. H. Borthwick of *ASRE* announced that an inspection tour of the Chapel and Library building of the new Wake Forest Campus in Reynolds had been arranged by Louis M. Bouvier, also of *ASRE*. The meeting then adjourned. Attendance 29. Attendance ratio 0.23.

• *OKLAHOMA*: *Radiant Ceiling Panels and Controlled Human Comfort* was the topic discussed at the April meeting by W. C. Kadow, liaison engineer, Burgess-Manning Co., Chicago, Ill. Mr. Kadow presented an excellent technical discussion on the design and results of a radiant heating and cooling panel used in conjunction with an acoustical ceiling. His talk concluded with a general discussion.

A report from the nominating committee was heard prior to Mr. Kadow's speech, and the meeting was presided over by Vice Pres. F. R. Denham. Attendance 64. Attendance ratio 0.46.

• *OREGON*: After a short business meeting presided over by the retiring president, Dick Blankenship, the speaker of the evening was introduced at the April meeting by W. R. Norte, as Carvel Linden, chairman of the Exposition-Recreation Commission. Mr. Linden traced the efforts of civic groups which led to the successful campaign for an Exposition-Recreation Center and outlined the needs which the Center satisfied. His talk was followed by an interesting discussion.

At the conclusion of the talk, President Blankenship gave an annual report of the chapter's progress. Members appreciated that it had been a fine year under excellent leadership. Past President T. E. Taylor then officially installed the newly-elected officers and the new president, W. R. Norte, accepted the gavel for the coming year. Attendance 60. Attendance ratio 0.21.

• *PACIFIC NORTHWEST*: Members at the April meeting heard reports from the membership and nominating committees, which followed the introduction of guests by the presiding officer, Pres. P. I. L. Winsor.

Program Chairman L. F. Christofferson introduced the speakers, Robert Shepherd, Pacific Northwest Pipe Line Corp., and

Norbert Fratt, vice president in charge of sales, Washington Natural Gas Co. Mr. Shepherd, who illustrated his talk with a color film, discussed the problems of wholesale gas distribution and pipe line installation. Mr. Fratt spoke on the distribution of natural gas in the Pacific Northwest area. Members showed their interest by the numerous questions at the conclusion of the two talks. The speakers were thanked by President Winsor. Attendance 76. Attendance ratio 0.40.

• *PHILADELPHIA*: Officers elected at the April meeting presided over by Pres. A. M. Robertson were as follows: *President*—C. J. Lubking; *First Vice President*—P. H. Yeomans; *Second Vice President*—C. J. Forve; *Treasurer*—J. J. Hucker; *Secretary*—Ludwig Mack; and along with the officers D. S. Plewes will serve on the Board of Governors. The following new members were also presented to the chapter: Hugh Mahaffy, H. F. Brush and F. W. Weisenbach.

After the business meeting was concluded, Dr. Lucien Brouha, M.D., physiologist, E. I. du Pont de Nemours & Co., Wilmington, Del., spoke on the *Effect of Heat on Physiological Reaction of Man at Work*. Attendance 59.

• *PITTSBURGH*: John Everetts, Jr., regional director, Regions Central Committee, Region 1, spoke at the April meeting, presided over by Pres. C. L. Benn, on the chapters' regional plan. He illustrated his explanation by showing slides.

After the conclusion of the business meeting, Program Chairman E. J. Busch introduced the speaker, K. E. Robinson, ventilation engineer, Research Laboratories Div., General Motors Corp., Detroit, Mich. Speaking on *Comfort and Make-Up Air for Industrial Buildings*, Mr. Robinson explained the meaning of comfort in industrial plants and the way to correct bad conditions. He also outlined the effect of make-up air on circulation in some plants. His talk was illustrated by slides and stimulated a vigorous question period at its conclusion. Attendance 84. Attendance ratio 0.63.

• *ROCKY MOUNTAIN*: Pres. L. L. DeLong introduced the April speaker, W. F. Peters, regional sales manager, Anemostat Corporation of America, New York, N.Y. Mr. Peters presented an illustrated talk on *High Velocity Air Distribution*. He pointed out some of the advantages of the system and gave the group several design suggestions.

Elected to office were: *President*—A. S. Widdowfield; *Vice President*—D. D. Pearsall; *Secretary*—R. T. Beck; *Treasurer*—C. DiMercurio; *Board of Governors*: L. L. DeLong, J. W. Braak and W. V. Burbank. Attendance 42. Attendance ratio 0.22.

• *SACRAMENTO VALLEY*: A report on the First Regional Meeting in Portland, Ore., was given by V. W. Thornburg at the April meeting at which Pres. R. A. Sarro presided. President Sarro then selected Maurice Laks, D. K. Coyle and R. T. Andrews to serve on the auditing committee, and a report was given by the chairman of the nominating committee, E. C. McKinsey.

Mr. Thornburg then introduced the guest speaker, Don Cousins, The Marley Co., Kansas City, Mo., who presented an interesting talk on *Cooling Tower Know-How*. Attendance 49. Attendance ratio 0.28.

• *SOUTH CAROLINA*: An informal discussion on chapter meeting procedures was held in April by the South Carolina Chapter, with Pres. R. K. Rouse presiding. President Rouse began the discussion by listing the operation of other chapters, and members exchanged views on the schedules, programs, and policies to be followed.

Reports were heard from the nominating, reception and special events committees, and the guests were welcomed by V. A. Morrow, membership committee chairman. Attendance 35. Attendance ratio 0.38.

• *SOUTH TEXAS*: After accepting nominations from the nominating committee, members at the April meeting, at which Pres. F. M. Neil presided, heard an interesting panel discussion on the function, use, and application of controls.

J. C. Lewis, program chairman, introduced C. C. Quinn, branch manager, Powers Regulator Co., Houston, as panel chairman. As panelists he introduced William Emdee, Barber-Colman Co.; C. D. Adams, Jr., branch sales manager, Minneapolis-Honeywell Regulator Co., Houston, Tex.; K. S. Alexander, sales engineer, Johnson Service Co., Houston; and Frank McKain, Minneapolis-Honeywell Regulator Co. The meeting ended with a question period. Attendance 65.

• *SOUTHERN CALIFORNIA*: A vote of thanks was given at the April meeting to the budget committee for their efforts in preparing a realistic budget for the chapter, after they heard a report on the new budget by Pres. J. L. McCullough. Reports were also heard from H. B. Nottage, chairman of the codes and standards committee; R. C. Taylor, chairman, membership committee, who introduced three new members; and W. O. Stewart, chairman, nominating committee, who reported on nominations for officers for the coming year.

The speaker for the evening was J. M. Ayres, design engineer, Pereira & Luckman, Los Angeles, who spoke on *Radiant Heating and Cooling*. Mr. Ayres, who was introduced by Melvin Kodmur, gave a very interesting talk which was followed by a question and answer period. Attendance 144.

• *SOUTHERN PIEDMONT*: A very interesting discussion of the morals and other aspects of advertising was given at the April meeting by Bob Alexander, in charge of advertising, *Charlotte Observer*, Charlotte, N.C. J. A. Rice presided.

Prior to the talk, reports were heard from A. W. Bainbridge, concerning the summer meeting at Roaring Gap; and from E. D. Streng, on membership. It was noted that some of the younger, prospective members were themselves recommending people to join the chapter, a trend members were anxious to encourage.

• *WESTERN MASSACHUSETTS*: New methods of heating in metropolitan districts were suggested by Lewis Smith, C. A. Dunham Co., Chicago, Ill., at the meeting in March. T. C. O'Connor introduced the speaker.

The nominating committee report was read by the chairman, R. J. Hildreth, at this meeting presided over by Pres. R. E. Cross. Attendance 27. Attendance ratio 0.45.

• *WESTERN MICHIGAN*: After reports from the secretary, treasurer and the nominating committee chairman, the April meeting was turned over to the program chairman of the evening, by the presiding officer, Pres. S. M. Paganelli. The program chairman introduced the speaker, C. W. Millson, vice president in charge of field sales, Acme Industries, Inc., Jackson, Mich., whose subject was: *Heat Pumps Proven Practical in All Climatic Areas*.

Mr. Millson said that heat pumps are available in two types — the water source type and the air source type. The former, he said, is used principally in Southern Florida but the latter is of general application. Mr. Millson pointed out that if adequate insulation is provided, the initial cost is comparable to a good, forced warm air or hot water installation, and the operating costs are favorable. He said that more and more systems of the type described will be sold, but cautioned against indiscriminate sales promotion which lures people into using the heat pump where it is unsuitable. Mr. Millson presented slides and diagrammatic charts to illustrate his argument. The meeting adjourned after a lively question period. Attendance 56.

• *WESTERN MICHIGAN*: J. T. Anderson, program chairman, introduced the speaker, K. E. Robinson, ventilation engineer, Research Laboratory Division, General Motors Corp., Detroit, Mich., at the March meeting, presided over by Pres. S. M. Paganelli. Discussing *Comfort and Makeup Air for Industry*, Mr. Robinson pointed out that one of the most important needs in industry today is an environment where employees can work comfortably and efficiently. He feels that management is ready and willing to spend the money to secure an engineered system patterned to meet its requirements. To make working areas comfortable, according to the speaker, it is necessary to control the rate of cooling of the space, not to heat the individual in the space. Mr. Robinson further advised consideration of all interior heat loads, shielding occupants from radiant heat effects,

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and endeavoring to pressure areas if possible. Colored slides shown demonstrated actual job scenes. Attendance 50.

• *WESTERN NEW YORK*: *Vibration and Noise Control for Air-Conditioning Equipment* was the topic discussed by D. H. Vance, The Korfund Co., Inc., Long Island City, N.Y., at the April meeting, presided over by Pres. C. W. Kaupp. V. N. Harwood, program chairman, introduced Mr. Vance, who treated the theory of vibration and noise control for heating and ventilating air-conditioning equipment and reviewed typical installations of spring rubber and cork-type isolators. Attendance 35.

• *WISCONSIN*: Seventeen junior and senior students from the University of Wisconsin were guests at the April meeting presided over by Pres. I. J. Rossiter. Professor Elliott of the University Mechanical Engineering Department was also present. Reports were heard from the membership, the special events and the auditing committees.

The speaker for the evening was Lee Miles, who spoke on *Residential Air Conditioning*. He was introduced by C. E. Melcher, and the meeting adjourned with a rising vote of thanks to the speaker. Attendance 73. Attendance ratio 0.23.

• *WISCONSIN*: *Money* was the topic covered by Robert Duffy, vice president, Marine National Exchange Bank, who was presented by H. K. Forfar, program committee chairman, at the March meeting. Mr. Duffy touched on various aspects of his subject, including credit, interest returns, relationship of the Federal Reserve Bank to local banks, availability of money, and usual procedures in borrowing for construction work.

Pres. I. J. Rossiter announced the appointment of W. G. Schlichting, N. E. Hill and L. C. Plaehn to the nominating committee. Attendance 48. Attendance ratio 0.23.

• *PURDUE UNIVERSITY*: A joint meeting of the student and senior branches was held in April. Eighteen students were present, as well as the faculty sponsor, Prof. F. B. Morse, to hear a talk on air distribution using various types of air diffusers. Attendance 19. Attendance ratio 0.34.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 57 men who are candidates for membership or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before July 31, 1956, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: †Reinstatement *Advancement

Arizona (*Region* 4)

YELLOTT, J. I., Secy.-Treas., *Association for Applied Solar Energy*, Phoenix.

California (*Region* 4)

AYRES, J. M.*, Cons. Mech. Engr., Los Angeles.

WICKS, A. B., Chief of Htg. & Refrig. Div., City of Los Angeles, Dept. of Bldg. & Safety, Los Angeles.

Connecticut (*Region* 1)

DANBAGH, W. J., Dist. Mgr., General Controls Co., Hartford.

District of Columbia (*Region* 5)

ECHOLS, M. P., JR.*, Special Repr., York Corp., Washington.

Illinois (*Region* 2)

COOPER, J. V., Pres., Cooper-Cooley Co., Inc., Decatur.

MONK, C. B., JR., Mgr., Archt. & Engg. Research, Structural Clay Products Research Foundation, Geneva.

ORAVETZ, J. A.*, Chief Engr., U. S. Government, Engrg. Office, Ft. Sheridan.

STEVENS, H. C.*, Vice-Pres., Hunter Clark Ventilating System Co., Chicago.

Iowa (*Region* 3)

GUSTIN, J. W., Asst. Mgr., Leighton Supply Co., Fort Dodge.

Kansas (*Region* 3)

BARNARD, E. R., Sales Engr., General Heating & Cooling Co., Salina.

Kentucky (*Region* 5)

KIPPE, T. H., Engrg. Technician, Johnson Service Co., Louisville.

Louisiana (*Region* 5)

ALBRIGHT, J. F., JR., Sales Engr., The Powers Regulator Co., New Orleans.

Maryland (*Region* 5)

TRAGESER, J. W., JR., Proj. Engr., Lloyd E. Mitchell, Inc., Baltimore.

Massachusetts (*Region* 1)

BRAYMAN, A. I.*, Supervising Design Engr., Chas. T. Main, Inc., Boston.

HOPKINS, E. B., JR., Field Engr., Chas. T. Main, Inc., Boston.

KOSLOWSKI, J. A., Mgr., Filter Sales & Service Divs., Boston Filter Co., Inc., Charlestown.

MCKEOWN, C. J., Equipment Specialist, U. S. Army, Quartermaster Research & Dvlpt. Command, Natick.

SHARE, MAX, Sales Engr., Boston Filter Co., Inc., Charlestown.

Michigan (*Region* 2)

BEACH, D. B., Designer, T. H. Brehm Co., Inc., Oak Park.

BERG, H. K., Mech. Engr., O'Dell, Hewlett & Luckenbach, Birmingham.

CAUGHEY, R. G., Cons. Engr., Birmingham.

MARGOSSIAN, Z. I., Sales Engr., R. L. Deppmann Co., Detroit.

ROLAND, J. H., Sales Engr., American Blower Corp., Detroit.

SENIOR, K. A., Br. Engr., The Carrier Corp., Detroit.

STROLL, A. J., Chief Engr., Grand Heating Co., Detroit.

Minnesota (*Region* 3)

BUMGARDNER, R. L., Sales Engr., The Powers Regulator Co., Minneapolis.

HANSON, R. H., Sales Engr., The Powers Regulator Co., Minneapolis.

Missouri (*Region* 3)

KELLER, J. B., Pres. & Gen. Mgr., Paragon Heating & Plumbing Co., Kansas City.

WILLIAMS, J. B., Asst. Engr., Burns & McDonnell Engineering Co., Kansas City.

Montana (*Region* 3)

BETTRIDGE, J. W., Appl. Engr., Minneapolis-Honeywell Regulator Co., Billings.

New York (*Region* 1)

CHOURZAMANIS, ANTHONY, Mech. Engr., Sanderson-Porter, New York.

HARWOOD, V. N.*, Owner, V. N. Harwood Co., Buffalo.

Ohio (*Region* 2)

BLACK, R. L., Sales Engr., Johnson Service Co., Toledo.

KIRK, W. B. Chief Research Engr., American Gas Association Laboratories, Cleveland.

MCFADDEN, V. F., Jr. Engr., The Austin Co., Cleveland.

NABAKOWSKI, M. W., Pres., A. Nabakowski Co., Amherst.

SCHINDEL, R. L., JR., Field Service Engr., A. M. Byers Co., Cincinnati.

TAYLOR, WILLIAM, Sr. Mech. Engr., The Austin Co., Cleveland.

Oklahoma (*Region* 6)

JESSUP, S. L., Estimator, Standard Roofing & Material Co., Oklahoma City.

Pennsylvania (*Region* 1)

KOLSUN, E. J., Mech. Engr., Paul P. Kopf, Cons. Engrs., Philadelphia.

SHAFER, D. L., Field Sales Engr., Weil-McLain Co., Allentown.

STERN, E. J., Sales Engr., The Powers Regulator Co., Philadelphia.

South Carolina (*Region* 5)

BURDETTE, T. C.*, Chief Engr., Kirby Hammond, Inc., Greenville.

Tennessee (*Region* 5)

CARTER, D. G.*, Sales Engr., The Trane Co., Knoxville.

VANDIVER, R. E., Sales Engr., Johnson Service Co., Knoxville.

Texas (*Region* 6)

BLANKE, J. R., Partner, Blanke Mechanical Contractors, Fort Worth.

GOODWIN, M. D., Cons. Engr., El Paso.

LEWIS, ROSS, JR., Mgr. Htg. & A-C Sales, Triangle Electric Supply, El Paso.

LOCKWOOD, I. C., Sales Engr., Steel & Engineering Products Co., El Paso.

NAIL, P. C.*, Vice Pres., Walker & Associates, Inc., Cons. Engrs., Houston.

THOMAS, J. E., SR., Repr., The Crane Co., El Paso.

Virginia (*Region* 5)

BRITTON, W. B., Sales Engr., Chet Adams Co., Norfolk.

Washington (*Region* 4)

BAKER, C. A., Supt., Brandt Bros. Co., Spokane.

DISOTELL, D. D., Repr. & Estimator, Hughes & Co., Spokane.

ENGLERT, J. A., Asst. Mgr., Vermiculite Contractors, Inc., Seattle.

FANSLER, G. F., Mgr. & Pres., Western Gas & Power Co., Spokane.

HARRINGTON, L. J., Repr., Larry Harrington Co., Inc., Seattle.

KOEHLER, C. F., Draftsman, K. M. Wood & Assoc., Spokane.

MANTKUS, C. T., Br. Mgr., E. H. Langdon Co., Seattle.

MCKEE, B. E., Pres., Atlas Boiler & Equipment Co., Spokane.

MELROSE, C. J., Mgr. of Operations, Spokane Natural Gas Co., Spokane.

PENNING, R. G., Sales Mgr., Spokane Natural Gas Co., Spokane.

SCHULZ, F. C.†, Jr. Engr., H. E. Bovay, Jr., Cons. Engrs., Spokane.

TURNER, R. C., Sales Engr., Westinghouse Electric Corp., Sturtevant Div., Seattle.

West Virginia (*Region* 5)

CASDORPH, W. A., Vice-Pres. & Treas., West Virginia Heating & Plumbing Co., Charleston.

HOLDERBY, G. D., Htg. Dept. Mgr., Bailey-Farrell Co., Charleston.

Wyoming (*Region* 3)

ROADS, W. R., Htg. Engr., Northern Utilities Co., Casper.

Canada (*Region* 7)

BENNETT, L. M.*, Assoc., John H. Ross, Cons. Engr., Toronto, Ont.

CAUCHON, CAMILLE, Sales Engr., Minneapolis-Honeywell Regulator Co., Ltd., Ste. Foy, Que.

MCCARTNEY, D. M., Div. Mgr., Engineering Industries Co., Ltd., Toronto, Ont.

SKINNER, H. R.*, Engr., Waterman-Waterbury Mfg. Co., Ltd., Regina, Sask.

SMITH, A. F. N., Field Engr., A. M. Byers, Co., Montreal, Que.

TRAVERS, A. H., Mgr., A-C. Div., Tri-Bec, Inc., Quebec, Que.

England

FINCHER, NORMAN, Chief Tech. Engr., Htg. & Vtg. Div., Arthur Herton & Co., Ltd., Liversedge.

France

OSCHE, ARISTIDE, Pres. & Gen. Mgr., La Thermostatique S. A., Les Lilas.

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Italy

GRAZIOLI, GUIDO, Work's Mgr., Aeromeccanica Italiana Borla, Turin.

Lebanon

RICE, L. E., Chief Engr., Messrs. Abdul Rahim & Chafic Diab, Beirut.

Venezuela

TOWNSEND, J. C., Chief, A-C. & Refrig. Engr., Compania Shell de Venezuela, Maracaibo.

OBITUARIES

G. L. ERWIN, JR., AND C. E. TOWNER DIE IN PLANE CRASH

The crash of a private plane in Jeffersonville, Ind., on May 15, 1956, resulted in the death of the pilot, co-pilot, and 6 executives of the Crane Co., Chicago, 2 of whom were members of the Society. The Crane Co. personnel were on their way to Louisville to attend an *HP&AC-CVA* convention. The deceased ASHAE members are George L. Erwin, Jr., 60, vice president, and Charles E. Towner, 42, supervising engineer.

Mr. Erwin, who received his M.E. from Cornell University in 1917, was connected with the Kearney & Trecker Corp. for 14 years previous to joining the Crane Co. in 1936. He served that company as district manager and assistant to the vice president, sales, previous to attaining the vice presidency. Mr. Erwin, who resided in Palatine, Ill., is survived by his wife, Helen, and a daughter, Mrs. Nancy Meyers.

Mr. Towner, a resident of Oak Lawn, Ill., joined the Crane Co. in 1937, the year of his graduation from the University of Minnesota with a B.S. in mechanical engineering. He became successively testing engineer, assistant research supervisor and research supervisor. For the last 4 years he served as assistant to the vice president, heating sales division. Surviving Mr. Towner are his widow, Leah, and a daughter, Lynne.

NICHOLAS J. MATHEY

St. Joseph, Mo.

Nicholas J. Mathey, a Life Member of the Society, died on May 6, 1956. Mr. Mathey, who was 76 years old at the time of his death, had retired 2 years ago.

Born in Kaundorf, Luxembourg, Mr. Mathey moved with his family to Le Mars, Ia., when he was a young boy. His first position was that of an apprentice steamfitter with the Symms Powers Co., Sioux Falls, S.D. In 1910 he opened his own shop in Le Mars, which he ran until 1943.

In later years he joined the Sunflower Ordnance Works, Sunflower, Kans., and became a member of the Kansas City Chapter. He continued his work as a steamfitter and heating engineer on various projects in the Midwest until his retirement in 1954.

From 1949 on Mr. Mathey made his home in St. Joseph Mo. Surviving are his wife, Hazel; a daughter, Ginevra, Los Angeles; a son, Gervais, Chula Vista, Calif.; and a sister, Sister Gilda, Sisters of Christian Charity, Detroit, Mich.

C. P. ROBERTS, MEMBER GUIDE COMMITTEE, DIES AT 53

Carlton P. Roberts, 53, junior partner and chief engineer, Voorhees, Walker, Smith & Smith, New York, N.Y., died at the Columbia County Memorial Hospital on May 28. Mr. Roberts had been stricken by a heart attack while en route by train to Schenectady, N.Y.

A member of the Society since 1952, Mr. Roberts was currently serving on the Guide Committee and the ASHAE-*AIA* Committee on Cooperation. He had been a member of the TAC on Cooling Load from 1953 to 1955, and of the TAC on Thermal Circuits in 1955.

Mr. Roberts, who was born in Parkersburg, W. Va., received his B.S. in physics from Cambridge University in 1924 and his M.S. in the same subject from the University of Berlin, 1927. Following several connections with consulting engineering firms, he opened a private practice as a consulting engineer in Elizabeth, N.J., in 1933.

During World War II, he served with the rank of colonel as chief engineer, First Army Headquarters. Having seen action in Europe and the Pacific, Mr. Roberts was awarded the Bronze Arrow-

head for leadership in landing with assault troops in Normandy. He also received five battle stars, the Legion of Merit, the Bronze and Silver Stars, the Purple Heart, and the Army Commander's Commendation. The French government awarded him the Croix de Guerre with palm.

When he returned to civilian life in 1945, he joined the firm which was then known as Voorhees, Walker, Foley & Smith in the capacity of chief engineer. He supervised engineering design for the Savannah River Plant, Atomic Energy Commission, Augusta, Ga.; Ford Research and Engineering Center, Dearborn, Mich.; Argonne National Laboratory, Chicago; Henry Ford Clinic, Detroit; International Business Machines Research Laboratories, Poughkeepsie, N. Y.; A.F.L.-C.I.O. Headquarters Building and the new Atomic Energy Commission Building in Washington.

Mr. Roberts was also a member of the *National Society of Professional Engineers*, the *American Society of Military Engineers*, the Morris County Golf Club and the Masonic Order.

He leaves his wife, Mrs. Dorothy Waye Roberts; his mother, Mrs. Wilhelmina Roberts; and a brother, Richard. He made his home in Springfield, N.J.

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MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, J. N. Livermore, 2000 Second Ave. (26). SECY, J. B. Olivieri, 37294 Ilene, Mt. Clemens.

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, F. L. Murray, 492 W. Michigan Ave., Battle Creek. SECY, R. J. Waalkes, 500 E. 8th St., Holland.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, E. T. Erickson, 500 Investors Bldg. (2). SECY, J. H. Jester, 621 E. Hennepin Ave.

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, J. W. Doggett, Jr., 254 Kimbrough Dr. SECY, D. F. Ingram, 408 W. Fortification St.

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, H. M. Spencer, 1510 Main St. SECY, J. E. Miller, 5830 Outlook, Mission, Kan.

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, E. T. Ciucas, 4354 Olive St. SECY, N. J. Hubbuch, Jr., 7020 Cornell, University City (5).

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, T. E. Davis, 4303 Dodge St. SECY, C. A. Faller, 1802 Mason St. (2).

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, W. C. Kruse, Jr., 183 N. 13th St. (7). SECY, S. H. Nitzberg, P.O. Box 157, Wood-Ridge.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Mon. PRES, H. F. Munn, 419 Granite, N.W. SECY, J. K. James, 4462 Avenida del Sol.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, H. J. Morton, 122 Lincoln Ave. SECY, E. L. Moyer, R. D. 2, Jamesville.

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, G. G. Davis, 111 S. Church St., Schenectady. SECY, M. E. Waddell, 1623 Central Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, J. B. Hewett, 64 Buena Vista Dr., Dobbs Ferry. SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, V. N. Harwood, 250 Delaware Ave. (2). SECY, J. F. Bedard, 505 Franklin St.

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, L. R. Gorrell, 1412 Chester Rd., Raleigh. SECY, C. E. Amick, 1042 Oakmont Ave.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, J. A. Rice, 719 E. Worthington Ave. SECY, E. D. Streng, P.O. Box 4083.

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon. PRES, W. A. Schoonover, 2901 N. High St. (2). SECY, R. C. Liebert, 623 N. High St. (11).

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, A. H. Gerdsen, 224 E. Second St. (2). SECY, T. D. Reiley, 1905 Dunlap St. (14.)

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, D. E. Tullis, 1720 Parkhill Drive (6). SECY, L. P. Brehm, Jr., 111 S. Broomfield Rd.

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, H. R. Canoyer, 1900 Superior. SECY, R. D. Wilson, 2142 E. 19th St. (15).

Toledo: 1954. Hdqrs., Toledo. PRES, J. F. Guest, 1815 N. 13th St. SECY, Robert Greenwald, 2525 Portsmouth Ave. (13).

OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, F. R. Denham, 320 Oklahoma Natural Bldg. (2). SECY, W. R. Johnson, 120 E. Main.

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, H. W. Meinholtz, Box 2261. SECY, H. L. Cauvel, 3342 East 41st St.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, W. R. Norte, 2225 N. E. Broadway (12). SECY, G. G. Van Alst, 947 S. E. Market.

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, C. J. Lubking, 3345 W. Hunting Park Ave. (32). SECY, Ludwig Mack, 412 W. Hortter St. (19).

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, R. M. Toucey, 223 Fourth Ave. (22). SECY, G. E. Smetak, 1238 Brighton Rd. (23).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, J. E. McMurray, 1639 Blanding St. SECY, A. L. Blackstone, Jr., 1630 Laurel St.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, W. L. Henson, 496 S. Main St. SECY, G. B. Ramsey, Jr., 157 Neil St. (3).

TEXAS

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, H. G. Gregerson, 4512 Livingston (5). SECY, Ross Zumwalt, 929 Mercantile Securities Bldg. (1).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, F. M. Neil, P.O. Box 13197 (19). SECY, A. B. Ullrich, 2520 Huldy St. (19).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, Boone Crisp, Rt. 2, Box 421. SECY, D. T. Kern, 14 Chandler Bldg. (5).

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, J. C. Wharton, P. O. Box 1240. SECY, D. G. Halley, 3608 Ave. A.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, R. C. Evans, 2549 Wilmington Ave. (6). SECY, G. E. Wright, Jr., Dooly Bldg.

VIRGINIA

Virginia: 1948. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, C. G. Conaway, Jr., 7454 Hank Ave. (5). SECY, E. R. Simpson, Jr., 720 Guy St.

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, Max Tonn, 4021 S. Latawah. SECY, R. D. Nevers, E. 124 Augusta, P.O. Box 5026 (21).

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, L. F. Christofferson, 425-1411 Fourth Ave. Bldg. (1). SECY, H. M. Hendrickson, Mech. Engrg. Dept., University of Washington (5).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, I. J. Rossiter, 231 W. Wisconsin Ave. (3). SECY, R. D. Rodwell, 152 W. Wisconsin Ave. (3).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, D. W. Thomson, 1690 W. Broadway (9). SECY, W. F. Keenan, 54 W. Fifth Ave. (10).

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, G. C. Davis, 212 Waverly St. (9). SECY, A. H. Millar, 342 Mandeville St., St. James (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, S. R. Plamondon, City Planning Dept., Smoke Control Division, City Hall. SECY, Arthur DeBreyne, 9 St. Denis St., St. Lambert.

Northern Alberta: 1956. Hdqrs., Edmonton. PRES, W. C. Woods, 13908 116 Ave. SECY, E. K. Cumming, 10249 104 St.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, C. J. Bootes, 15 Torbarrie Rd., Downsview. SECY, H. R. Roth, 57 Bloor St., W.

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, E. J. Schoenherr, 32 Clarey Ave. (1). SECY, C. W. Watson, 102 Bank St.

SPECIAL BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, Walter Hausler, Erbstrasse 2, Kusnacht. SECY, L. F. de Bruyn, Muhlebachstrasse 172 (8).

STUDENT BRANCHES

North Carolina State College: 1948. Hdqrs., Raleigh. PRES, P. K. Tuggle, 407 Gay St., Kannapolis. SECY, G. L. Waitman, P.O. Box 3790, North Carolina State College.

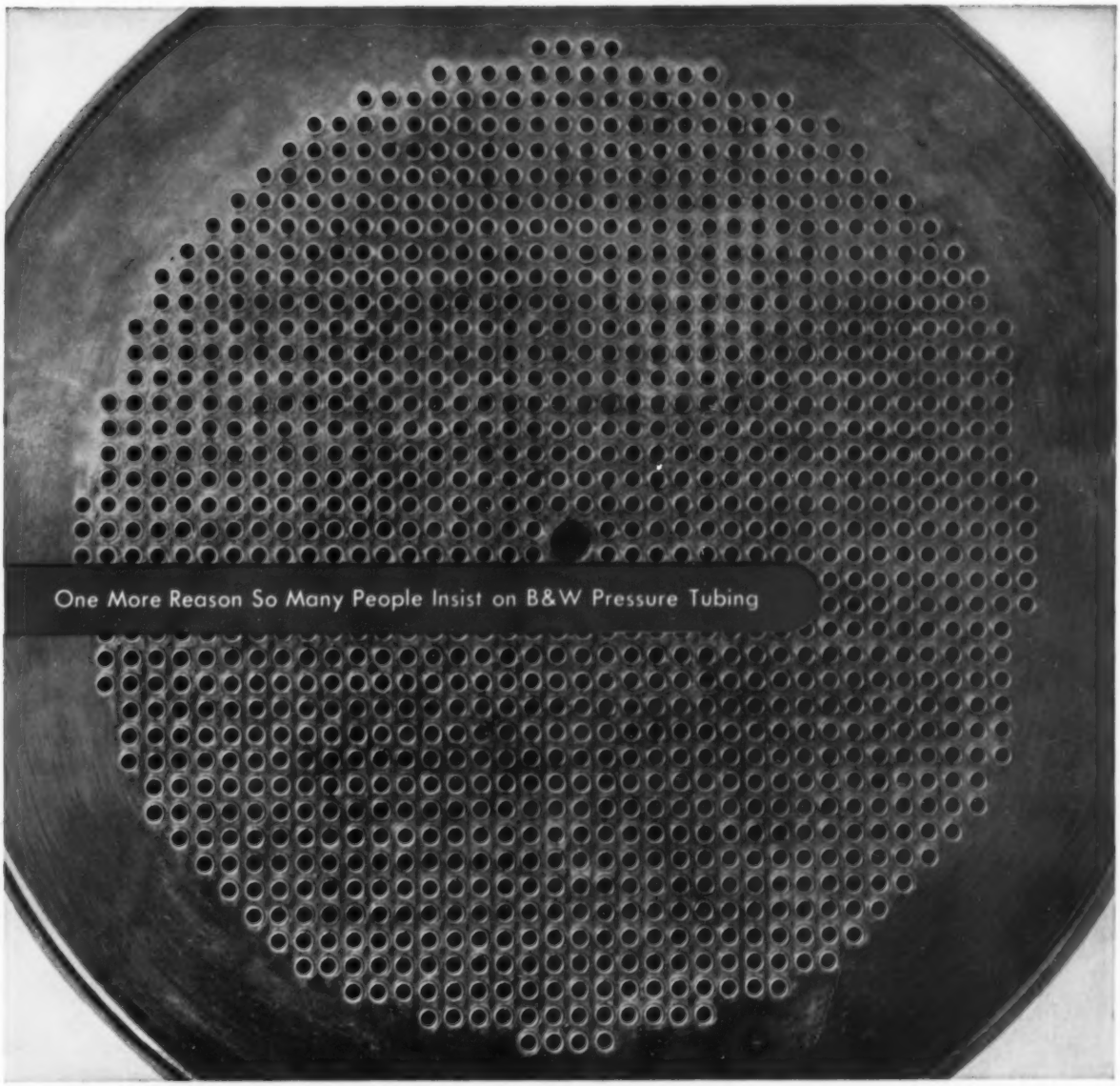
Oregon State College: 1949. Hdqrs., Corvallis. Meets, 1st Wed. after 1st Tues. PRES, P. I. Anderson, 202 N. 10th. SECY, D. W. Strahan, 233 Mall St.

Purdue University: 1948. Hdqrs., W. Lafayette, Ind. PRES, R. F. Puncochar, School of Mech. Engrg. SECY, G. T. Vail, Jr., School of Mech. Engrg.

Texas A. & M. College: 1946. Hdqrs., College Station. Meets, 2nd and 4th Tues. PRES, D. F. Carroll, Box 6264. SECY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.

University of Detroit: 1949. Hdqrs., Detroit. Meets, 1st Tues. PRES, L. J. Hayes, Jr., 16254 Santa Rosa Dr. (21). SECY, E. F. Hoelscher, Jr., 14283 Cherrylawn (38).

University of Toronto: 1951. Hdqrs., Toronto. PRES, C. F. Smale, 347 Kennedy Ave. (9). SECY, T. D. Digel, 204 King St., Weston.



B&W TUBING UNIFORMITY – MULTIPLIED 1194 TIMES

If you had this many tubes to roll in, there would be no delay if you used B&W tubes.

For heat exchangers, for condensers, in fact for every pressure tubing application, you can rely on B&W tubing for uniform wall thickness, uniform ductility, tight joints, and low installation cost.

Always specify B&W pressure tubing. It meets all dimensional and mechanical requirements, and is available, in all commercial sizes, in a wide range of carbon, alloy and stainless grades. *Write for Technical Bulletin* 329-HP

B&W TUBULAR PRODUCTS DIVISION

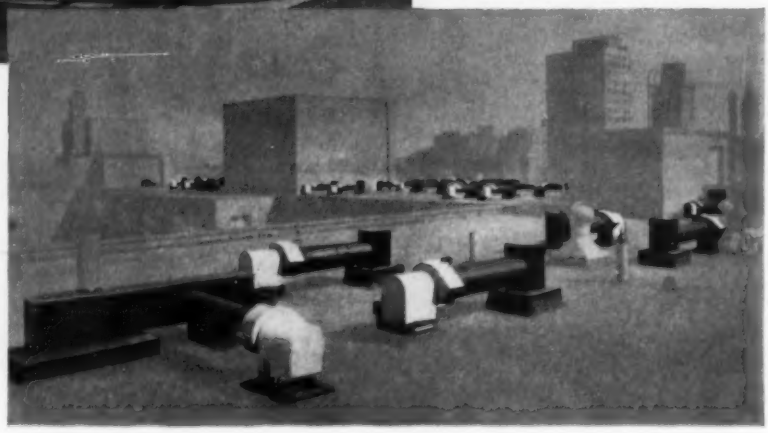
THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa. and Milwaukee, Wis.: Seamless Tubing, Welded Stainless Steel tubing
Alliance, Ohio: Welded Carbon Steel Tubing
Milwaukee, Wis.: Seamless Welding Fittings

TA-5019(F)

BIG or SMALL . . .

Peerless Blowers Solve All Types of Ventilation Problems

AT left is a large Peerless Backward Curve Blower installed on the roof of one of the nation's largest automobile body plants. Its job is to draw air from the ceiling of the press room and discharge it, for ventilation purposes, into the press pit which is below ground level.



AT right is a grouping of 39 small Centrifugal Exhaust Blowers on the roof of a 14-story, 299-unit apartment building. They handle about 30,000 cubic feet per minute exhausting odors and stale air from kitchens and bathrooms in the apartments below.

VERSATILITY in size and application has always been a Peerless strong point. Our engineers design to suit the existing conditions. You're not buying "off the shelf" when you specify Peerless Fans and Blowers for a specific exhaust or ventilation problem.

PEERLESS Fans and Blowers are unconditionally guaranteed to meet all established industry test codes (NAFM or PFMA). Their outstanding service records speak well for their dependable performance. 100% factory inspection assures constant top quality.

FAN AND BLOWER DIVISION

THE Peerless-Electric® COMPANY

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FANS · BLOWERS · MOTORS · ELECTRONIC EQUIPMENT

Write, wire or phone today for Bulletins SDA-160 or SDA-200.

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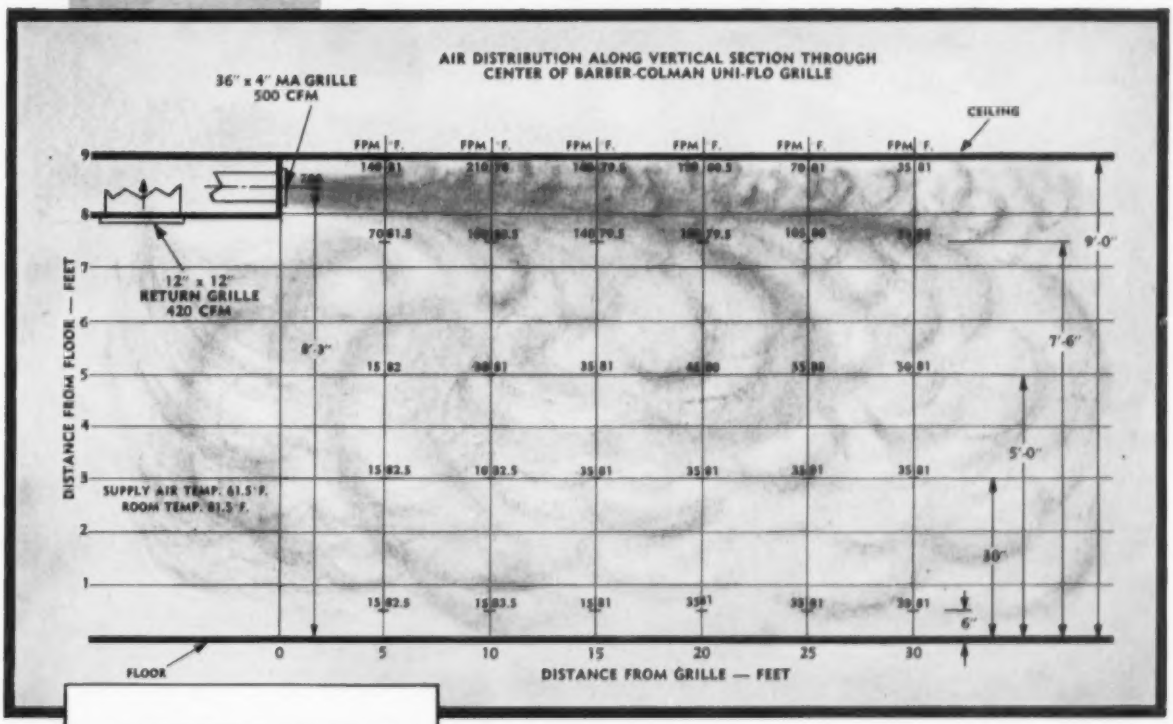
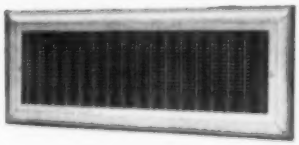
BARBER COLMAN

uni-flo

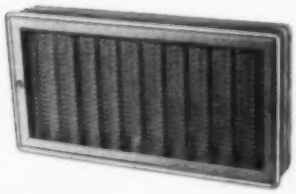
Engineered Air Distribution

predict and deliver air patterns like this...





Model MA
Double-Deflection Grille



Model FA
Double-Deflection Grille

Precision distribution of conditioned air from sidewall grilles is no problem when you specify Uni-Flo. Uni-Flo Grilles are true sidewall diffusers, designed to give adjustable air pattern and rapid diffusion without air stream drop or excessive air motion. Laboratory-tested, field-proved performance data permit the engineer to create required conditions without guessing. Variety of types available. For complete details, call your nearby Barber-Colman Field Office, or write . . .

Barber-Colman Company

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Cleaver-Brooks presents . . .

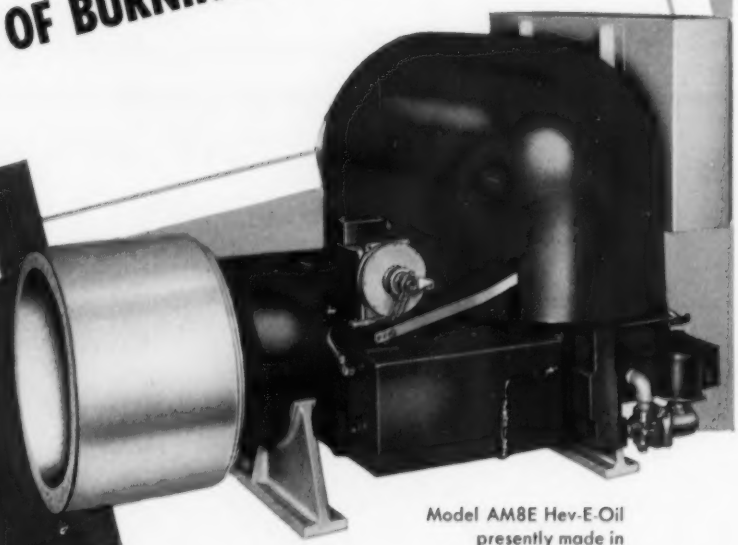
A REVOLUTIONARY NEW DEVELOPMENT IN THE ART OF BURNING RESIDUAL OILS

Hev-E-Oil Burner

THE FIRST AIR-ATOMIZING

DESIGNED FOR

No. 6 Oil



Model AM8E Hev-E-Oil presently made in 90 gph size only.

. . . A TRIUMPH IN MODERN COMMERCIAL HEATING

NOW — for the first time in the industry — an air atomizing, gun-type burner designed for No. 6 or Bunker C oil. Previous methods of burning residual oils — with their inefficiencies and high maintenance — are now obsolete.

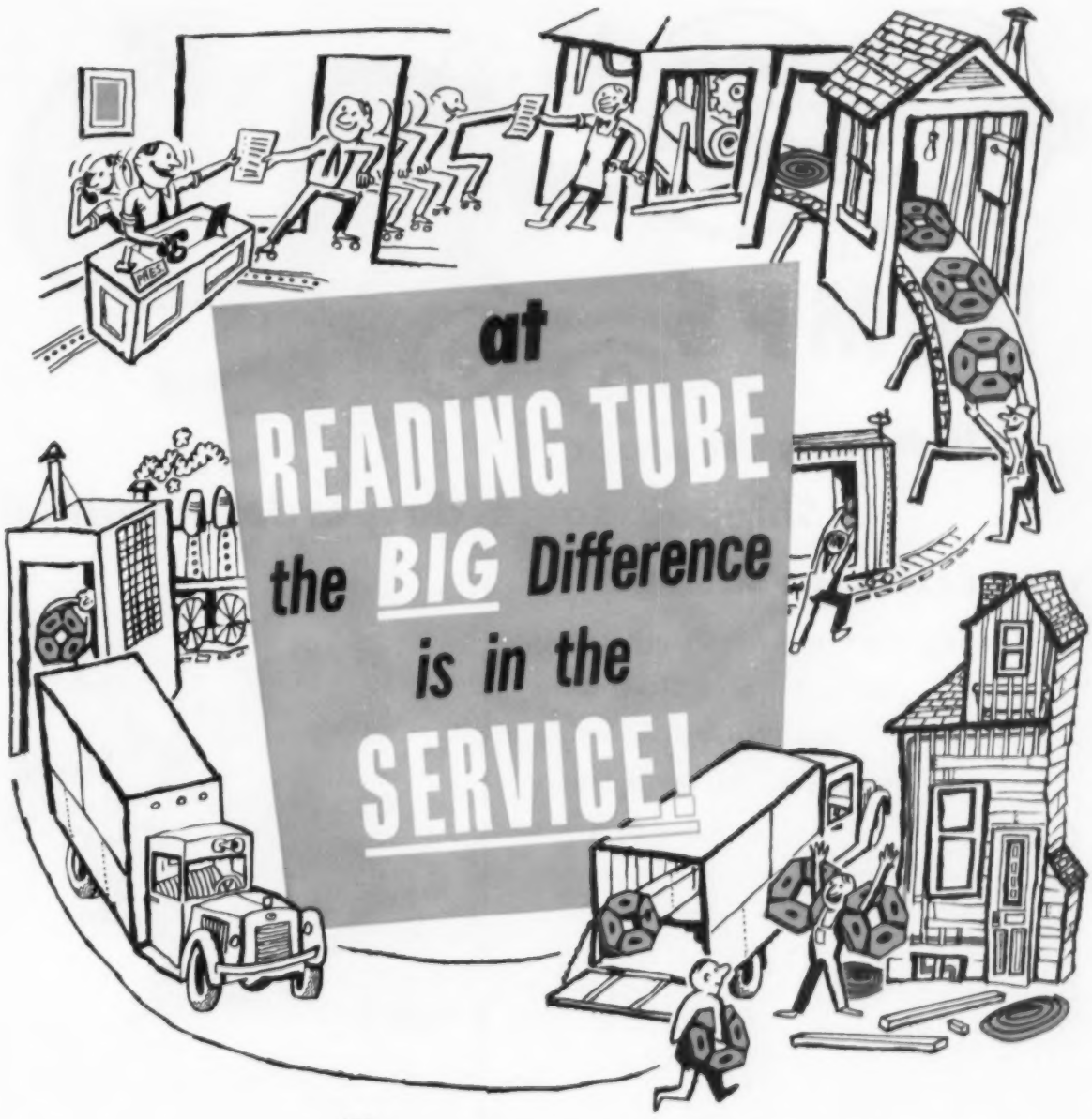
This great forward step in modern oil burning practice is another example of Cleaver-Brooks' leadership in burner research and engineering.

- No. 6 oil finely atomized — easily and completely burned.
- Burner equipped to bring hot oil to burner nozzle — ready for a perfect start at all times.
- Oil and air measured at all capacities — high CO_2 is maintained under all stack conditions.
- Straight electric ignition available.
- Pressurized lubrication increases service life.
- Fast installation — simple as a domestic burner.
- Latest type electronic controls are standard equipment — burner completely wired at factory.
- Burner completely fire-tested at factory.
- Low fire start — standard equipment.
- High-low modulation — standard equipment.
- Complete modulation available at slightly higher cost.
- Low and high fire easily set for most economical operation.
- Shape of flame can be adjusted for each particular installation.
- Post-purge insures no-drip, sure starting.
- Burner requires a minimum of service, a quality product made by Cleaver-Brooks — a leader in the development of combustion equipment.

Cleaver Brooks

DEALERS AND DISTRIBUTORS . . . write today — get the complete details on the new HEV-E-OIL Burner for No. 6 oil. CLEAVER-BROOKS COMPANY, Dept. H, 313 E. Keefe Ave., Milwaukee 12, Wisconsin.

HEV-E-OIL Burners . . . a quality product that builds your profit



READING'S distributors throughout the country tell us that it's our personal "Shirt-Sleeve" service — from our top brass on down — that makes them like to do business with us.

Reading's streamlined shirt-sleeve service eliminates delays — speeds delivery — from mill . . . to distributor . . . to contractor.

Next time you need copper tubing, specify *Reading* — precision product of one of America's largest, completely integrated mills — specializing in the processing of Copper Tube — from basic metal to finished product.

Remember — at Reading the BIG DIFFERENCE is in the SERVICE.

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LOS ANGELES, CALIF. 120 No. Santa Fe Ave.
DALLAS, TEXAS 9000 Sovereign Row Brook Hollow Industrial District
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CC CLOSE-COUPLED PUMPS*

All Pumps in stock
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TYPICAL C-C SERIES PUMP APPLICATIONS ARE:

Cooling Towers • Air Conditioning

Chilled Water Circulating

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Pneumatic Water Systems

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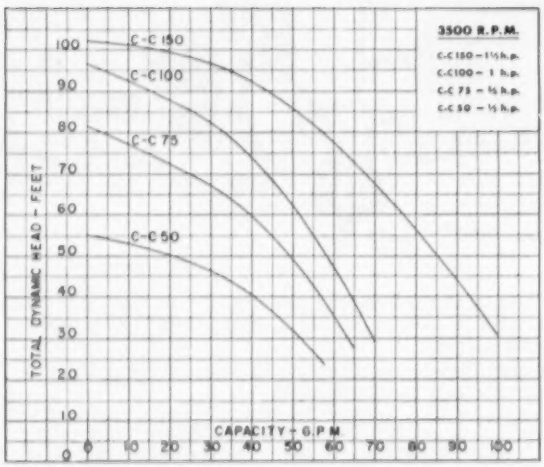
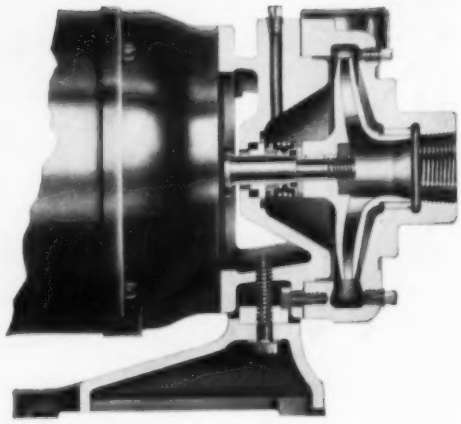


*For cooling towers, etc.



C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal". Each pump operates over the entire range of its curve quietly and smoothly without motor overload. Write to Department B for Bulletin 108-G.

CHICAGO PUMP COMPANY

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Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems . . . Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every Industrial use.

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QUIET OPERATION AND SATISFIED CLIENTS!

You can hardly hear Airtemp, it's so quiet! Chrysler engineering has made the difference, reduced the sound to a whisper. Airtemp has been manufactured to higher tolerances. Moving parts are dynamically balanced. Pressure lubrication reduces friction and wear. The result is air conditioning you can feel but not hear.

Quality engineering means a better product every time. It means lower installation and maintenance costs, continuous peak performance and more efficiency. It means happier, more satisfied clients.

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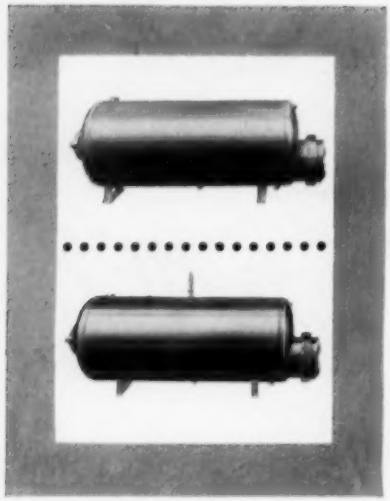
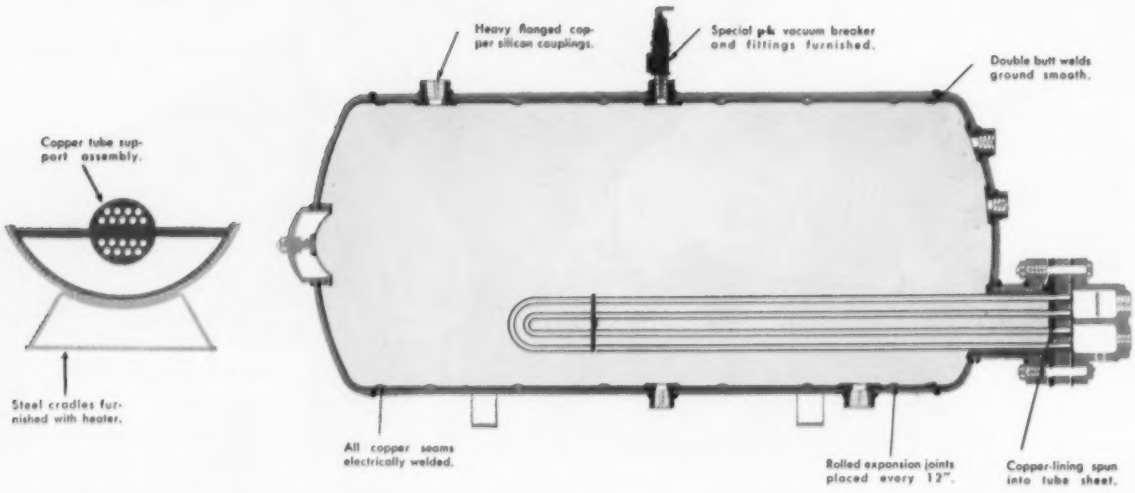


WHICH OF THESE

Copper-Lined HEATERS

WOULD YOU SPECIFY?

ONLY ONE has all these features


Heavy flanged copper silicon couplings.
Special p&k vacuum breaker and fittings furnished.
Double butt welds ground smooth.
Copper tube support assembly.
Steel cradles furnished with heater.
All copper seams electrically welded.
Rolled expansion joints placed every 12".
Copper-lining spun into tube sheet.

Like twins, copper-lined heaters can look pretty much alike—on the outside. But *inside*, and on key points of construction, they can be as different as day and night.

Engineers experienced in copper-lined heaters are aware of these vital differences and specify accordingly.

They insist, for instance, on rolled joints every 12 inches around the full circumference of the lining to allow for longitudinal expansion . . . on the copper-lining being not less than 3 lb. per square foot . . . on heavy flanged copper silicon couplings, welded to both the shell and the lining . . . on enough tube supports . . . on an adequately long tube bundle with parallel "U" bends . . . and on a vacuum breaker valve to protect the lining from sudden pressure fluctuation. They make sure that separate hydrostatic and pneumatic tests are run to guarantee that linings will be leakproof.

These experts specify these details, and others, found only in P-K heaters, because they know that heaters built *without* such safeguards are false economy; but that heaters "built right," like P-K's "Indestructo" copper-lined heaters, assure trouble-free service year after year.

Like the full story? We've detailed the key construction features in sample specifications and in P-K's new Catalog 19. Ask your local P-K representative for copies or write today.

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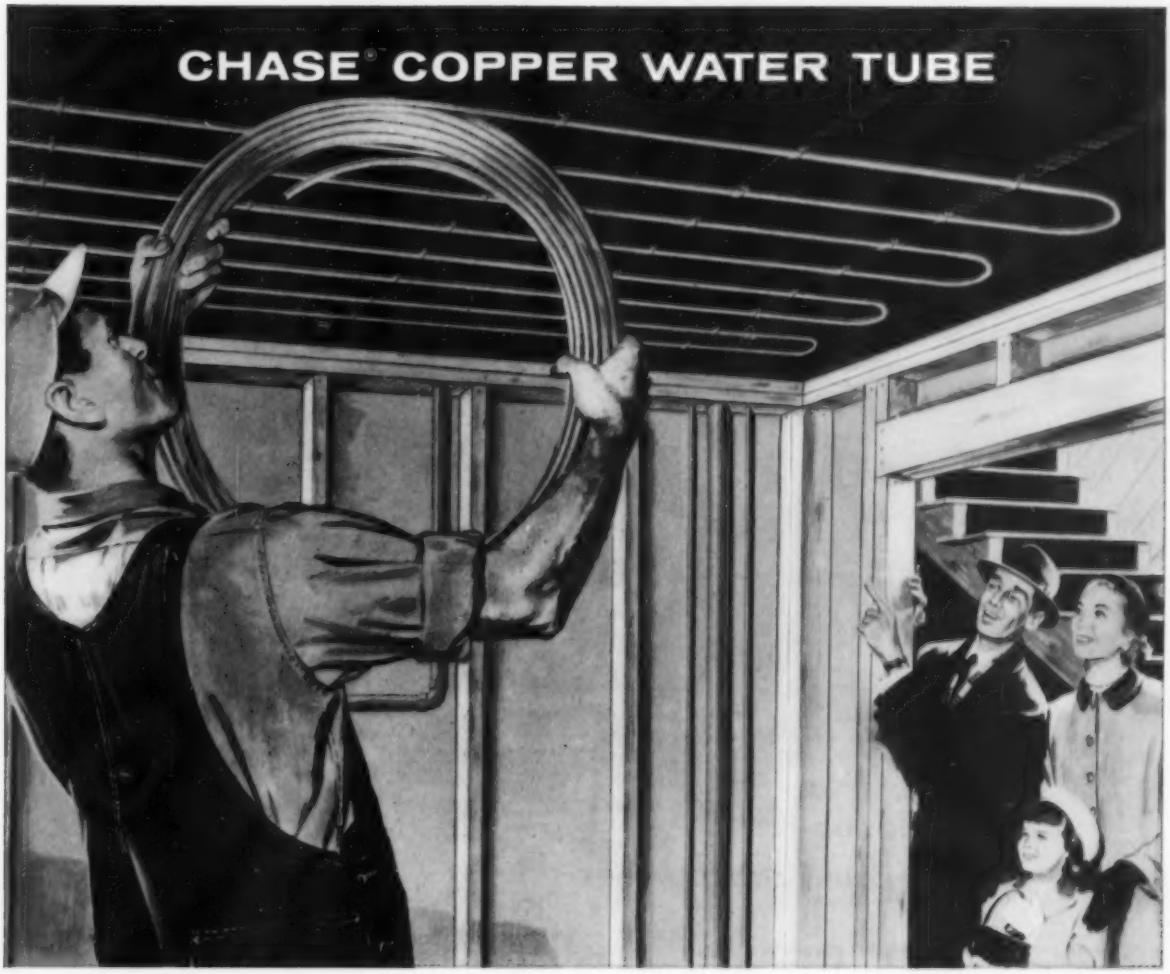
storage water heaters • instantaneous heaters • convertors • fuel oil heaters • freon chillers and condensers



NO CEILING ON COMFORT HERE !

But, plenty of ceiling on cost!

That's because lightweight, easy-handling Chase copper tube for radiant heating *installs faster!* Perfectly tempered, it easily unrolls into position on ceiling or floor. Comes in long 60 and 100-foot lengths that result in fewer joints. Connections are quickly made with simple soldering techniques.

Even the rugged carton for Chase copper water tube is designed to speed handling...save time! It's color-coded for easy identification of type and size. Has a center hole big enough for a firm grip. Can be stacked, rolled or carried with ease!

Proof that Chase copper water tube cuts installation time is the fact that it is being used in many of the largest housing developments where over-all costs *must be low!*

If it's radiant heating, be sure the system is made with Chase copper tube and solder-joint fittings.

Chase

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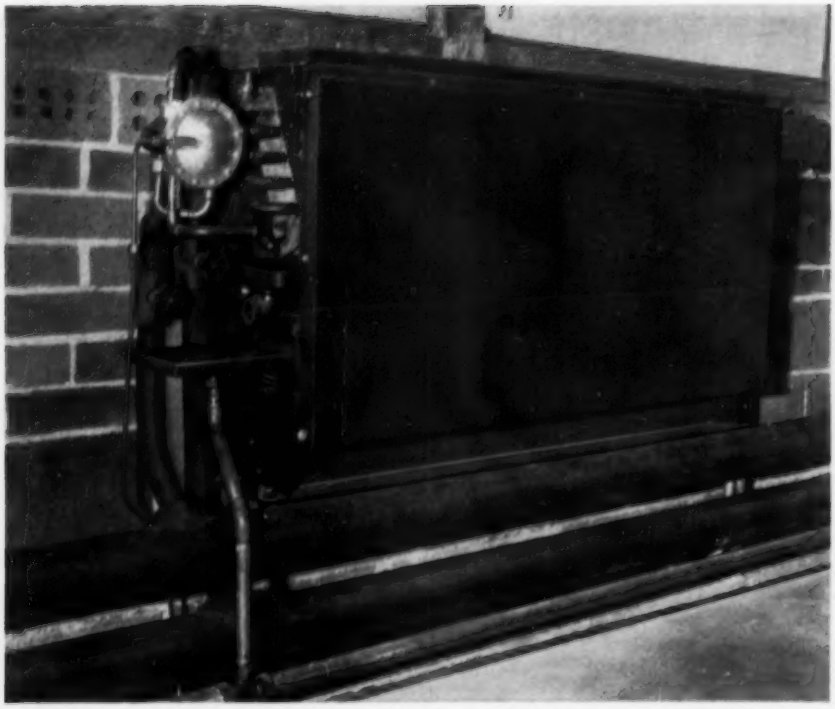


Condensation is prevented by Armaflex's closed cell structure and high insulation efficiency. Armaflex has a conductivity of 0.28 Btu./sq. ft./in. thickness/hr./degree F. temp. difference at 75° mean temperature. This installation is in new office building of Aircraft Marine Products, Inc., Harrisburg, Pa.

New insulation for liquid cooling lines

stops dangerous condensation

Now you can stop condensation for good on liquid cooling, chilled water, and other cold lines. Armstrong Armaflex*, a flexible new pipe insulation, completely seals out moisture and air. Armaflex is made of foamed plastic, with a closed cellular composition that provides an exceptionally efficient vapor barrier. In ½" thickness, Armaflex prevents condensation under normal design conditions on indoor lines operating as low as 32° F. Insulating efficiency always stays high because Armaflex stays dry.

Flexible enough to tie in knots, Armaflex can cut application costs by as much as 50% when compared with wrap-on or rigid type pipe coverings. It fits easily over pipe or tubing, follows contours without cutting or fitting. If lines are already in operation, Armaflex can be slit lengthwise, snapped into place, and sealed with Armstrong 520 Adhesive.

Armaflex is clean to work with, too. It is soft, odorless, and will not rub off, crumble or chip. There's practically no waste. Self-extinguishing, Armaflex can be safely installed before sweat fittings are made.

Armaflex comes in 6' lengths, for pipes and tubing to 3⅛" i.d. It can be used on lines operating from 32° to 200° F.

For the free booklet, "Armstrong Armaflex, a Flexible Pipe Insulation," write Armstrong Cork Company, 2007 Sherman Street, Lancaster, Pennsylvania.

Armstrong

INDUSTRIAL INSULATIONS

*TRADE-MARK

Fast, easy to apply, Armaflex can be slipped right over tubing or piping as it's being installed. A talc coating inside covering speeds application.

Rapid fabrication of fitting covers is accomplished by miter-cutting Armaflex. Then slit, snap into place, and cement with Armstrong 520 Adhesive.

For added safety, Armaflex is self-extinguishing. It can be applied in advance to copper tubing and held back with clamps while fittings are sweated.

Mill Road School, N. Merrick, L. I., N. Y., Arch.: Frederic P. Wiedersum

Cornelius Street School, E. Hempstead, L. I., N.Y., Arch.: Frederic P. Wiedersum

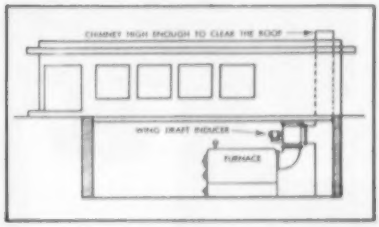
Central Dauphin High School, Harrisburg, Pa., Arch.: Edmund George Good, Jr.

Grace Wildey School, Roselle, N. J., Arch.: Ernest T. Brown

. . . modern schools use draft inducers — not tall chimneys.

Induced draft is the outstanding development in modern heating boiler operation. There is no longer need for tall unsightly chimneys. Wing motorized Draft Inducers easily solve the draft requirements. The only chimney needed is a stub stack to vent exhaust gases. Architects find this fits admirably into modern, low, functional school designs where the outmoded tall chimney would be impossible from an esthetic standpoint. Other advantages are lower fuel costs, lower capital costs, and, of course, positive adequate uniform draft regardless of wind or weather.

In confirmation of the above, there are over 1000 Wing Draft Inducer installations in schools alone, in all parts of the country, burning oil, gas or solid fuels. Hundreds more are being specified by architects and engineers as the unprecedented school program continues. Write today for a copy of Bulletin I-56 and special Schools Bulletin SCH-1.



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DRAFT INDUCERS

L. J. Wing Mfg. Co. 140 Vreeland Mills Road, Linden, N. J.
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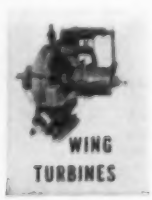

Write for bulletins. Use the coupon.

L. J. Wing Mfg. Co. HP-7
140 Vreeland Mills Rd., Linden, N. J.

Please send copy of Draft Inducer Bulletin I-56 and Schools Bulletin SCH-1.

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Firm .....
Address .....
City ..... Zone ..... State .....

In JENKINS *Monel-seated Bronze Gates*

THE WEDGE* TAKES THE WEAR - *and spares the rings*

Easy replacement of the wedge only — right on the line — restores full efficiency

THE MONEL SEAT RINGS are expanded into the body to assure a positive, leak-proof joint. Exhaustive tests in typical monel-seated gate valve services show that this permanent all-around support of the rings is essential to guard against deforming, loosening, or shifting.

***THE RENEWABLE WEDGE** (bronze or nickel alloy) has excellent wear resistance, but has a lower degree of hardness than the heat-treated Monel rings, which have optimum resistance to erosion and corrosion as well as abrasion. Thus, wear of the wedge leaves the rings relatively unaffected. When necessary to renew the wedge, you simply remove the valve bonnet, slip the old wedge off the stem, and slip on a new one.

GET PRACTICAL, LOW-COST RENEWABILITY in the valves you choose for the tough, punishing services that require Monel-seated gates. Compare . . . there is nothing simpler, faster, or more economical than Jenkins replaceable wedge design — and you also get the *plus* of Jenkins *extra value* in every other feature. Jenkins Bros., 100 Park Ave., New York 17, New York.

***MADE WITH BRONZE OR NICKEL ALLOY WEDGE**

The bronze wedge provides lasting economy for most applications. The nickel alloy wedge provides extra resistance where rapid wear and corrosion are factors.

JENKINS BRONZE GATES WITH MONEL SEAT RINGS

200 psi	300 psi
Fig. 270-U, Bronze Wedge	Fig. 280-U, Bronze Wedge
Fig. 270-UN, Nickel Alloy Wedge	Fig. 280-UN, Nickel Alloy Wedge
Fig. 270-UL, Bronze Wedge, U.L. approved for L.P.G. Services	350 psi
	Fig. 280-UX, Bronze Wedge

JENKINS BRONZE GATES INCLUDE 40 DIFFERENT PATTERNS

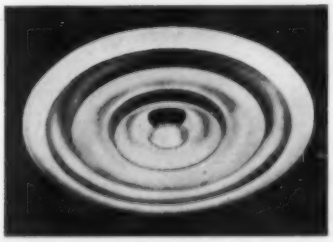
125 • 150 • 200 • 300 • 350 psi SOLID WEDGE • SPLIT WEDGE
SCREWED • FLANGED • SOLDER END • SOCKET END QUICK OPENING

Call your local Jenkins Valve Distributor for complete information.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.

EQUIPMENT DEVELOPMENTS

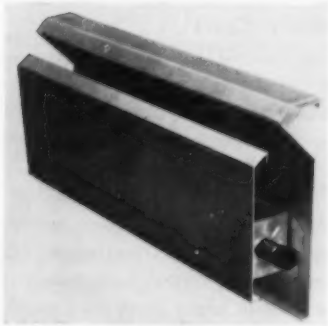
For reviews of Recent Trade Literature see Page 216



Ceiling Diffusers . . .

. . .designed to combine maximum air diffusion with modern styling—*Titus Mfg. Corp., Dept. HPAC, Waterloo, Iowa.*

Directly downward to full horizontal or any of intermediate air pattern stages can be achieved by turning small center cone, says company. All diffusers have four cones engineered for uniformity of design. Constructed of rigid steel, models TMA (fully adjustable) and TM (fixed cone) available in all sizes in a metalescent sprayed aluminum finish. Both models for exposed ductwork or flush mounting uses.



Baseboard Radiation . . .

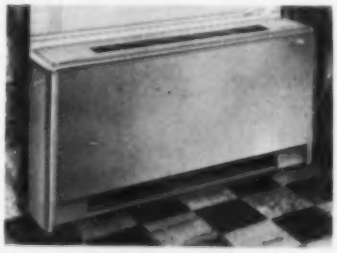
. . .for use with company's gas, hot-water heating boiler—*Hydrotherm, Inc., Dept. HPAC, Northvale, N.J.*

Employs non-ferrous heating elements composed of aluminum fins bound to ¾ in. copper tubing. Available in two capacity ranges: "A" is for average Btu output where unrestricted wall space is available; "H" is high capacity baseboard requiring less lineal footage for given heat load than average baseboard.

Electrode . . .

. . .designed to meet proposed AWS classification E6014—*Air Reduction Sales Co., Dept. HPAC, 60 E. 42nd St., New York* 17.

Has no tendency to "flat-top" and smooth beads, easy slag removal make it applicable for horizontal fillets, says company. Recommended for low open circuit voltage with a-c transformers of farm welder type.



Room Conditioner . . .

. . .with four-row, "high capacity" coil with low pressure drop—*Mueller Climatrol, Dept. HPAC,* 2005 *W. Oklahoma Ave., Milwaukee* 15.

Has dual low speed aluminum blowers, three-position fan speed switch, permanent cleanable filters accessable from front, and entire cabinet slips off chassis for ease of installation, says company. Units installed with three pipe connections; water supply, return, condensate drain. Units in two styles: one is recessed type with open ends for installation in alcove, wall, or with cabinet bases; other is for use flush against wall or under window. Both in fan capacities 200, 300, 400, 600 cfm.

Refrigeration Tube . . .

. . .with new end seal — *Wolverine Tube., Dept. HPAC, Guardian Bldg., Detroit* 26.

Seal gives positive protection against moisture, dirt; eliminates cutting off tube ends; has same outside diameter as tube; can be re-used, says company. Available in copper.

Submersible Pumps . . .

. . .in capacities to 8000 gpm—*Lancaster Pump & Mfg. Co., Inc., Dept. HPAC, Manheim Rd., Lancaster, Pa.*

Stainless steel fitted type "EMU" unit has bronze bearings; water-filled, water-cooled, water-lubricated motor. Available from 1/3 to 260 hp. For city water systems, large irrigation installations.

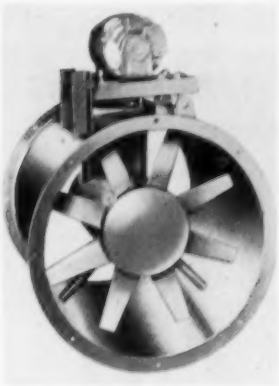
Spray Nozzles . . .

. . .designed without internal cores for "clog-free operation"—*Spraying Systems Co., Dept. HPAC,* 3219 *Randolph St., Bellwood, Ill.*

Outlet end directly opposite inlet so nozzles may be mounted in straight line. Engineered to provide hollow cone spray. Available in two types: "BD 10 WhirlJet" with ⅜ in. male pipe connections, "BB 50-50.3 WhirlJet" with ¾ in. male pipe connections.

EQUIPMENT DEVELOPMENTS

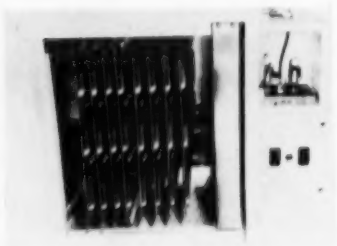
Continued



Axial Flow Fans . . .

. . .with wider blades for higher pressure characteristics with less operating noise—*Detroit Blower Corp., Dept. HPAC, 9867 Pacific Ave., Franklin Park, Ill.*

Designed with hub-tip ratios that enable larger blade angles near hub to produce pressure equal to that against which unit as whole is working, says company. Welded steel wheels, available with four, six, eight blades with diameters 12 to 72 in., have air moving capacities 1200 to 100,000 cfm.



Air Cleaning System . . .

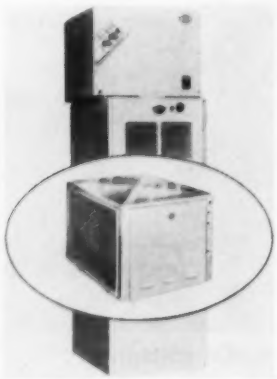
. . .designed for high operating efficiency—*Radex Corp., Dept. HPAC, 2076 N. Elston Ave., Chicago* 14.

Constant air circulation system removes up to 98 percent of all airborn dust, dirt, lint, pollen, says company. Unit, in return-air duct, collects coarse dirt particles in chemically treated aluminum filter. Microscopic particles that filter through pass through series of 8 alternately charged electrostatic plates. Charged air contaminants are drawn to oppositely charged plates, become trapped in adhesive coating.

Arc Welding Process . . .

. . .designed to maintain constant length throughout weld—*Air Reduction Sales Co., Div. of Air Reduction Co., Inc., Dept. HPAC, 60 E. 42nd St., New York* 17.

Single switch causes holder to move downward and start arc. Arc length, once set, maintained by automatic up and down movement of holder to follow irregular surfaces, says company. Accommodates electrodes from .040 to 5/32 in. diameter up to 24 in. long.



Air Conditioner . . .

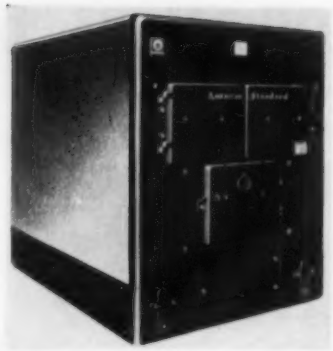
. . .for forced air installations, including horizontal, counterflow furnaces — *Utility Appliance Corp., Dept. HPAC, 4851 S. Alameda St., Los Angeles* 58.

Cited features are extra-large blowers, rubber resilient-mounted motor, 5/8 in. pre-charged lines. Condensing units come in four sizes: "Economy" two-ton, "Full" two-ton, three-ton, five-ton. "Economy-2" contains 12 in. blower; two-ton and three-ton, 16 in. blower; five-ton, 19 in. blower.

Fastener . . .

. . .designed to drive studs at better than 1 per min—*Remington Arms Co., Inc., Dept. HPAC, Bridgeport, Conn.*

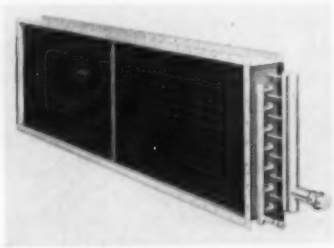
Constructed of three parts, weighs 3¾ lb. Twenty-two caliber power load sends stud into work surface when operator twists and depresses tool against surface and hammer blow against firing pin fires tool. "Mighty-Mite" must be held vertical to work surface before it will fire as safety measure.



Boiler . . .

. . .designed for maximum output rating in commercial, industrial, institutional hot water or steam heating—*American Radiator & Standard Sanitary Corp., Dept. HPAC, P. O. Box* 1226, *Pittsburgh* 30.

Has optional steel base. Can be used with all fuels, says company. Available in eight sizes, from five to 12 sections.



Steam Coils . . .

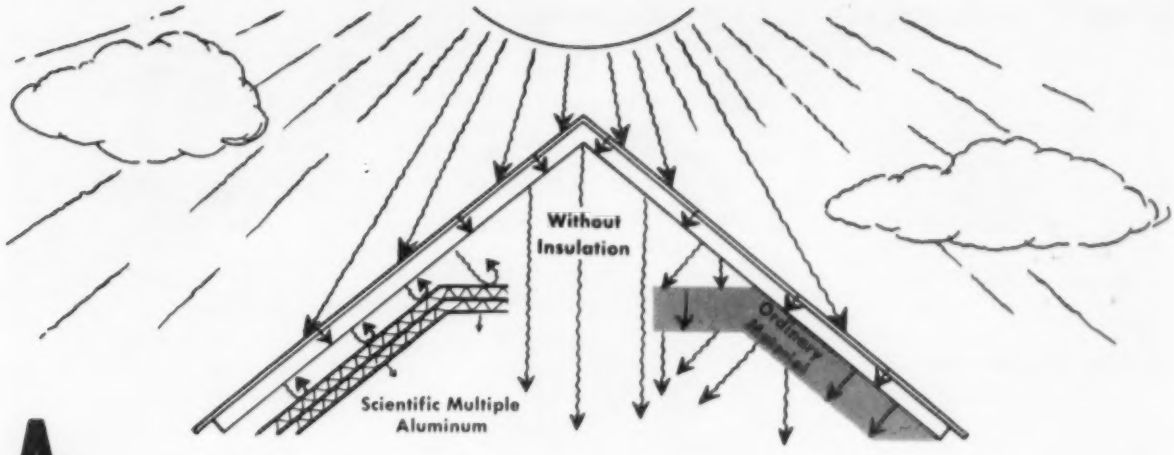
. . .engineered to provide equalized temperature throughout coil when steam is throttled—*Refrigeration Engineering, Inc., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles* 22.

Based on steam pressure, capacity, and shape of coil, circuits are arranged to provide maximum efficiency at all times, says company. Available in heavy duty, low capacity and non-freeze types.

Fire Truck . . .

. . .designed for fighting fires inside industrial plants—*Ansul Chemical Co., Dept. HPAC, Marinette, Wis.*

Can go anywhere a plant lift truck can go, says company. Is 5 ft 8 in. high with dry chemical, carbon dioxide, water provided as extinguishing agents according to plant's needs. Can be operated by one untrained man.



An Empty Roof Space Would Be The Best Insulation Against Summer Sun, *Were It Not For Radiation*

Most summer heat flow through empty roof space is RADIATION. There is little CONDUCTION through low density air, and no CONVECTION downward.

Ordinary materials may retard heat for a time, but store a large amount of heat as compared to empty space. More dense, there is greater heat flow by *conduction* than through just air. Moreover, their surfaces have a heat ray absorptivity and emissivity of over 90% and radiate heat into the building through the day, sometimes into the night.

The solution: Use a material which has little substance, whose surfaces face deep reflective air spaces and absorb and emit little radiation. Gold or silver foil would be excellent, but tough scientific multiple aluminum, which weighs but ¼ oz. per sq. ft., is inexpensive and almost as good, with a heat ray absorptivity and emissivity of only 3%.

Multiple aluminum is almost impervious to water vapor and is continuous, up to 750 ft. long. Infiltration under flanges is slight. The scientific construction of multiple layers of aluminum, fiber, and air spaces minimizes condensation formation on or within this type of insulation. Its slight mass is capable of little heat storage.

The National Bureau of Standards Booklet BMS52, "Effect of Ceiling Insulation Upon Summer Comfort" lists on Page 10 the relative effectiveness of the insulations tested in protecting ceilings against summer heat. First in effectiveness was two layers of aluminum foil (both sides of each layer reflecting). Second was full thick (3¾-inch) ordinary insulation. (Use coupon to get the booklet FREE!)

Try this test: Tack or scotch-tape 3 sq. ft. of multiple aluminum (we will send it free on request) to the underside of a hot roof or ceiling, whether uninsulated, or insulated with ordinary material. Step in and out of the protected area beneath. The difference will be so marked you will need no thermometer.

To obtain MAXIMUM, *uniform-depth* protection against heat loss and condensation formation, it is necessary to use the new edge-to-edge multiple aluminum*, each sheet of which stretches from joist to joist.

*Patent applied for.

INFRA INSULATIONS CAN BE PURCHASED everywhere through your preferred local dealer for 3¢ to 12¢ per sq. ft. depending on the type.

INFRA INSULATION INC.
525 Broadway, N.Y.C., Dept. H-7

Please send FREE:

☐ Bureau of Standards Booklet, BMS 52, "Effect of Ceiling Insulation upon Summer Comfort.

☐ 3 Ft. Square of Multiple Aluminum for Test.

Name _____

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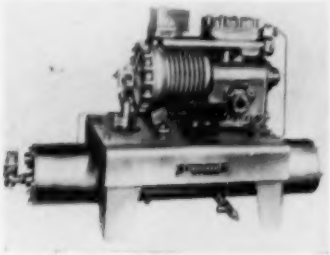
EQUIPMENT DEVELOPMENTS

Continued



10 Hp Condenser . . .

. . .for air conditioning applications —*Copeland Refrigeration Corp., Dept. HPAC, Sidney, O.*

Condenser is water-cooled shell and tube type, designed to permit either packaged or remote installation. Is 31⅜×20×53 in., including condenser water inlet connection. Three-cylinder motor-compressor has 2 3/16 in. bore, 2 in. stroke, 1375 ocfh at 1750 rpm refrigerant capacity.

Shaded Pole Motor . . .

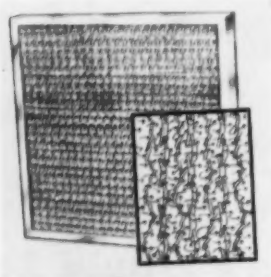
. . .for high output applications— *General Electric Co., Dept. HPAC, Schnectady* 5, *N.Y.*

With 5½ in. diameter, 1.5 watts output through 1/10 hp at both four-, six-pole speeds. Available in ratings 1/15 to 1/10 hp. Special "oil pump" groove on motor's shaft provides replacement of oil on bearing surfaces to extend bearing life, says company.

Valves . . .

. . .for commercial, light industrial uses—*General Controls Co., Dept. HPAC,* 801 *Allen Ave., Glendale* 1, *Calif.*

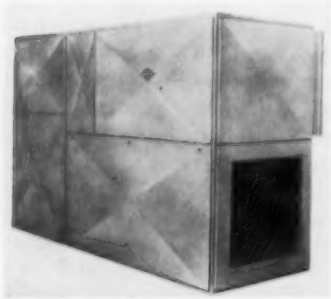
Suited for zone control in heating and air conditioning systems, hot and chilled water applications, says company. Provides for remote control in response to thermostats, limit or operating controls, remote switches, paralleling with motor driven burners, fans, etc. Actuator hermetically-sealed, positioned in-line with valve for more compact installation. In iron or bronze body.



Air Filter . . .

. . .with 1 in. thick all-aluminum design—*George Evans Corp., Dept. HPAC, Moline, Ill.*

Filter is said to hold to 200 percent more lint, dust without serious resistance to air flow. Precision angled openings in filter force air into high turbulence, rough talon like edges grip, hold dirt, let pack absorb quantities of lint, says company. Cleaned by flushing with tap water through garden hose, requires no high tension adhesive oil. In standard sizes.



Air Conditioners . . .

. . .for stores, large offices, industrial installations — *Union Asbestos & Rubber Co., Heating & Cooling Div., Dept. HPAC,* 332 *S. Michigan Ave., Chicago.*

Packaged units in two types: "AECR" equipped with evaporative condenser; "SCR" utilizes water cooled condensers. Matched evaporative condensers provide water savings to 95 percent, says company. Available in 7½ to 60 hp.

Portable Pump . . .

. . .with dry suction lift—*Jabsco Pump Co., Dept. HPAC,* 2031 *N. Lincoln St., Burbank, Calif.*

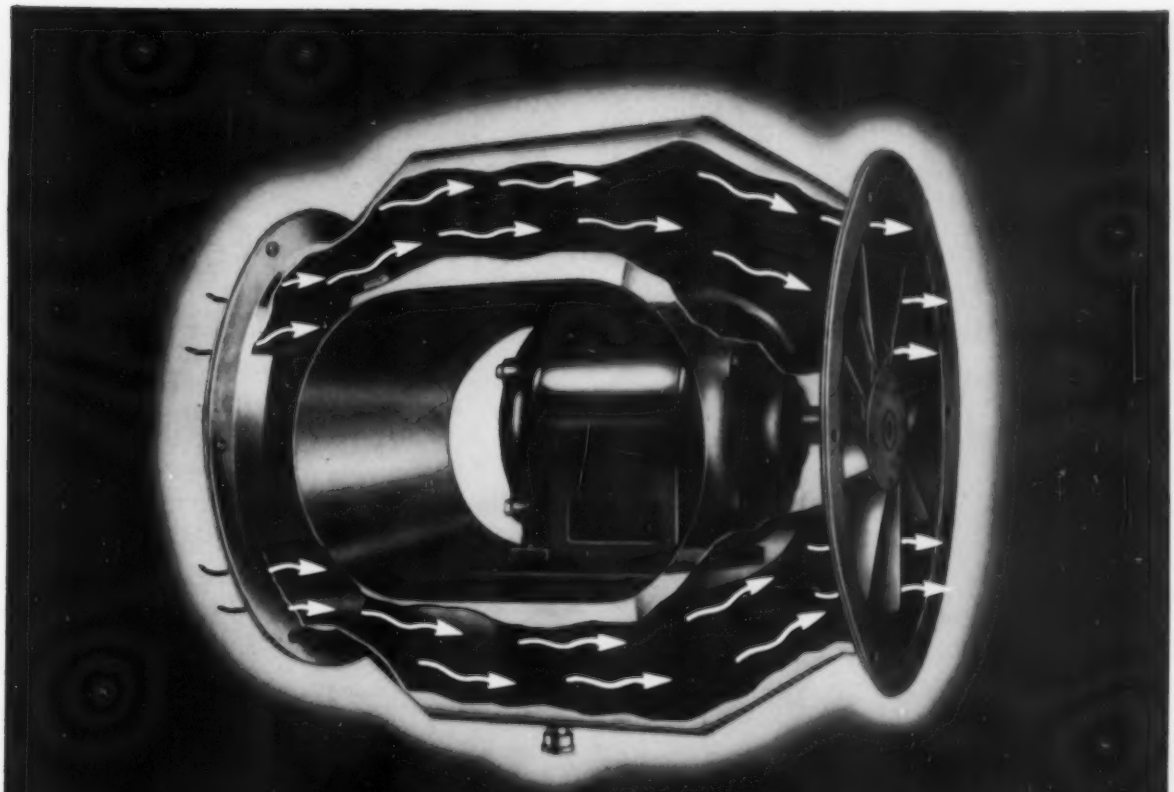
Unit consists of bronze self-priming pump with neoprene impeller, mounted on shaft of ¼ hp 1725 rpm electric motor. Vacuum switch stops motor when liquid supply runs dry. Unit's inlet, outlet ports are ½ in., designed to accommodate standard garden hose couplings. Operation is on 115 a-c voltage, 60 cycle, single phase. Capacity is 10 gpm against 10 ft head. For use to 20 psi.

Pipe, Conduit Bender . . .

. . .designed to make any degree bend in one setting—*Tal Bender, Inc., Dept. HPAC,* 417 *N. Water St., Milwaukee* 2.

"One Shot" available for pipe or rigid conduit, bus bar, radiant heat. Also to bend EMT, copper tubing, with pipe straightener, if used with all purpose frame. Has removable top-place which permits laying of pipe in from top, slide in from side, hook bender over installed pipe, says company. Available with bending shoes for 1 to 2 in.

(*Continued on page* 180)



YOU PAY NOTHING for the very element that makes THE DIFFERENCE in Bifurcator® Fume Removal

The important, cost-free element is DeBothezat's 30 years experience in designing top efficiency into a bifurcated-housing fan and in applying this fan unit to fume removal problems.

You can confidently specify a DeBothezat Bifurcator . . . install it . . . and have trouble-free operation.

De Bothezat FANS
A DIVISION OF
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DeBOTHEZAT FANS DIVISION, DEPT. HP-756
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☐ Send Bulletin DB-37-55 containing complete data on the Bifurcator for exhausting corrosive fumes.

☐ Have a DeBothezat representative call.

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ATTENTION MR. _____

Jobs like this are better with Bethcon

They're readying some ductwork for the ventilating system of a new auditorium. Those units were fabricated from Bethcon galvanized sheet steel, which gives them an edge over similar sheet-metal ducts of only two or three years ago.

That edge stems from the fact that Bethcon is Bethlehem's *continuously* galvanized sheet. Bethlehem's continuous galvanizing imparts certain improvements to the sheet, which in turn make for better sheet-metal jobs.

Chief advantage of Bethcon is the superior bond between zinc coating and base metal. This lets you put Bethcon sheets through severe forming processes—even to bending it double—without cracking or peeling of the zinc.

The coating is more uniform, too, both in thickness and in appearance. The center and ends of Bethcon sheets all get equal coating weight and equal protection, and there is no bead along the drip end. Spangles are brighter and more attractive.

You can get Bethcon in cut sheets or coiled strip, 14-gage or lighter. Either plain carbon or corrosion-resisting Beth-Cu-Loy (copper-bearing steel) can be used for the base metal, depending on your requirements. For further information, just put in a call or write a note to the Bethlehem district sales office nearest you.

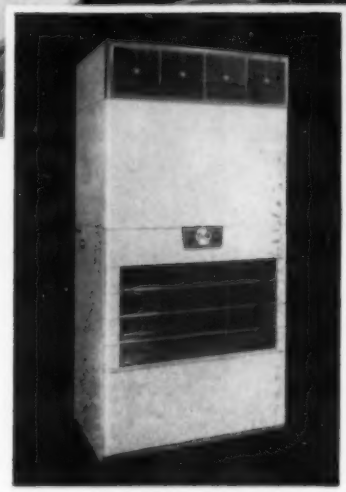
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

THEY'RE ALL YOUR PROSPECTS WITH JOB-MATCHED YORKAIRE CONDITIONERS



18 models from 1½ to 15 hp · water cooled and air cooled (waterless) · can be installed outside air-conditioned space, side-by-side for large areas, out-of-doors or off-the-floor.

Hotel, restaurant, factory or store—business or professional building—one floor or many—*all* are hot prospects when you sell job-matched Yorkaire Conditioners with exclusive Hi-Ef Cooling!

Yorkaire Packaged Conditioners can be tailored to your customer's exact requirements. They keep pace with his expanding needs. When he moves, they move right along with him.

York's exclusive Hi-Ef Cooling gives you another big selling advantage: Hi-Ef means high efficiency, greater economy of operation—up to 12% more cooling capacity with no increase in power consumption!

SELL THE QUALITY LEADER . . . *SELL YORK!*

Don't miss out on York's Big 4—four dynamically new selling approaches that expand your selling season from a few months to the entire year! Find out how York's sensational new training program can open the door to big profits for you. Mail the coupon for full details.

York refrigeration air conditioning

the quality name with the quantity profits

Manager of Sales, Commercial Division, Dept., AC-7.
York Corporation, York, Pa.

☐ Tell me how job-matched Yorkaire Conditioners and York's Big 4 will put new life in my profit picture!

☐ I'm interested in York's new training program.

Name_____

Company_____

Address_____

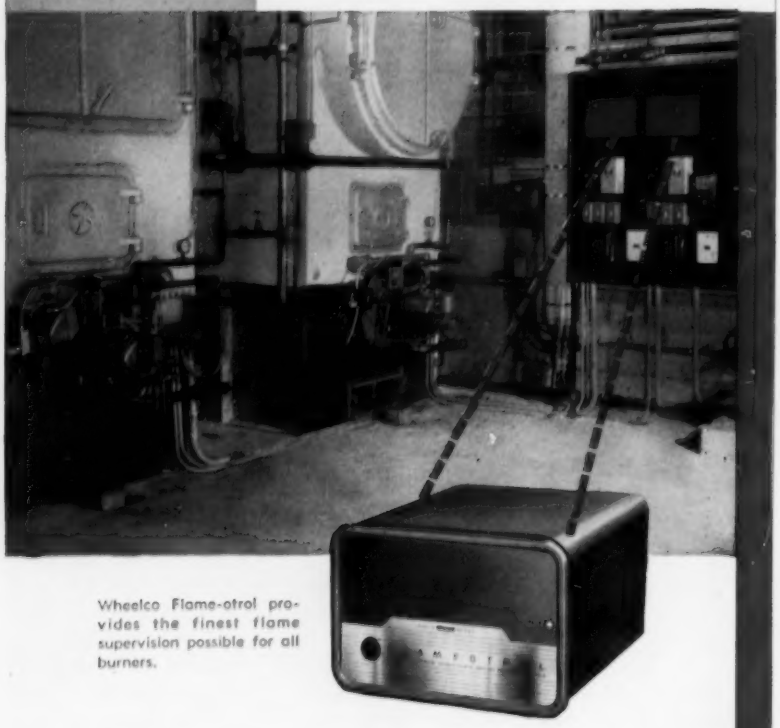
City_____ Zone_____ State_____

THE MARK OF QUALITY

BARBER COLMAN

Wheelco Instruments

Flame-otrol Combustion Safeguard System gives positive protection for any burner, any fuel



Wheelco Flame-otrol provides the finest flame supervision possible for all burners.

Wheelco Flame-otrol combustion safeguard systems offer unfailing, positive protection for any burner—gas, oil, combination gas-oil.

One basic type, the Series 1470 Conductivity-Rectification system, uses the ability of a flame to conduct current to protect manually or semi-automatically ignited gas, oil, or combination fuel burners.

Series 1570 Infrared System, the other basic type, depends on the fluctuating current of a flame frequency for relay response. All Wheelco Flame-otrols offer the advantages of compact plug-in design, standard electronic tubes, heavy-duty construction, and other advanced features. Your Wheelco field engineer can help you select the right flame supervision system, choosing from a full line of instruments and accessories. Call him today.

WHEELCO INSTRUMENTS DIVISION

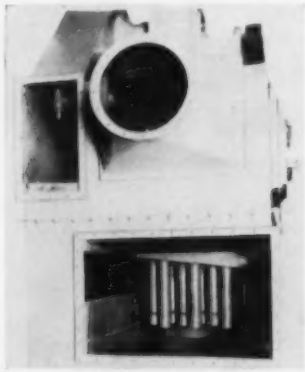
Barber-Colman Company

DEPT. G, 1501 ROCK STREET, ROCKFORD, ILLINOIS

BARBER-COLMAN OF CANADA, LTD., Dept. C, Toronto and Montreal, Canada

EQUIPMENT DEVELOPMENTS

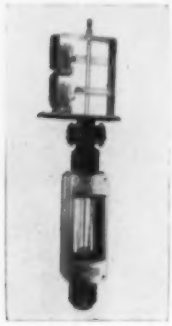
Continued From page 180



Fume, Odor Removing . . .

. . .equipment engineered to remove low and sub-micron size particles from exhaust gases—*Johnson-March Corp., Dept. HPAC,* 1724 *Chestnut St., Philadelphia* 3.

All-metal scrubber forces solid matter to bottom by means of violent water turbulence, vigorous scrubbing action. "Type 'A' Hydro Precipitator Scrubber" has performed at 99.8 percent efficiency with dust loadings at 5 grains per cu ft and 70 percent of material below 5 micron particle size, says company. Unit measures 8×4×3 ft.



Flow Alarm . . .

. . .with two snap-action electrical contacts—*Fischer & Porter Co., Dept. HPAC,* 553 *Jacksonville Rd., Hatboro, Pa.*

Engineered to combine low cost with vibration-proof operation, says company. Positioned in mounting frame above or below magnet in float extension rod to give signal for either high or low limits of flow. Multiple alarms may be incorporated for special applications.

MARKED FOR LOW-COST INSTALLATION BY

PRE-SEALED **DURANT** INSULATED PIPE

● There's no guesswork where each unit fits into the system, when a D.I.P. shipment reaches the job. Every component—fitting, accessory, even straight length—is factory pre-numbered for a specific location matching that shown on system drawings.

Taking the guesswork out of installations is just one way D.I.P. helps you achieve lower original costs on insulated underground piping contracts.

Pre-insulated at the factory, and prefabricated in standard increments, D.I.P. conduit requires only direct top-position pipe welds and simple field joints. No special masonry, underground supports, backfills or sub-drains.

Continuing maintenance costs are less with D.I.P., too. It's tough, non-porous, integral layer of asphalt gives permanent protection from moisture, leakage or corrosion. This D.I.P. exclusive assures you of constantly high insulation efficiency throughout its years of service.

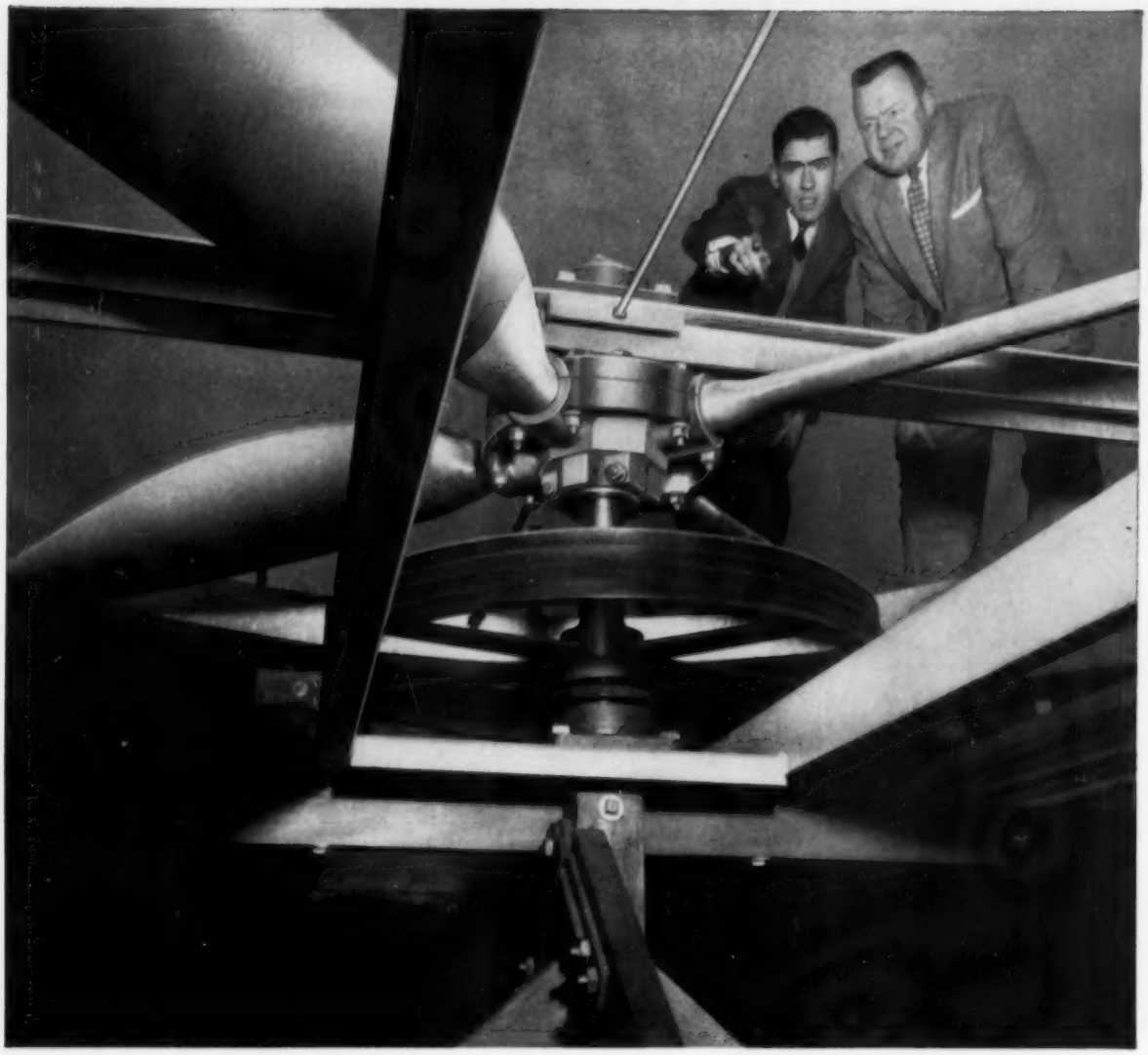
★ GET ALL THE COMPARATIVE FACTS ON D.I.P. WRITE TODAY FOR COMPLETE 54-PAGE CATALOG #35. NO OBLIGATION

Western Manufacturing Division
DURANT INSULATED PIPE COMPANY
PALO ALTO • CALIFORNIA

Eastern Manufacturing Division
DURANT INTERNATIONAL CORPORATION
WILLIAMSTOWN • NEW JERSEY

*Trademark

STAFF ENGINEERS AND REPRESENTATIVES IN PRINCIPAL CITIES AND IN CANADA ARE AT YOUR SERVICE.



"Take a look at the fan assembly on this LoLine Tower, Charlie."

"Looks rugged, doesn't it?"

"And it is. Yet the design is simple. About all there is to it is that heavy-duty fan wheel; those over-size bearings, the multi-V belt drive and that galvanized fan stack."

"Where's the motor?"

"Outside of the hot, moist air stream. No corrosion that way. Pritchard doesn't give rust a chance on the LoLine. Notice that the structural members supporting the fan assembly are hot-dip galvanized."

"But how about the fan shaft? Is it protected, too?"

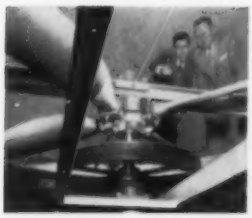
"Stainless steel! And it has self-aligning bearings. See how those snap rings are used for positioning bearings! Speaking of the bearings — you grease these bearings from *outside* of the tower."

"Outside!"

"Yes, see those copper tubes? They run from the grease fittings outside to the bearings. Makes lubrication much easier and a lot safer. Pritchard also makes available a speed reducer drive, if desired."

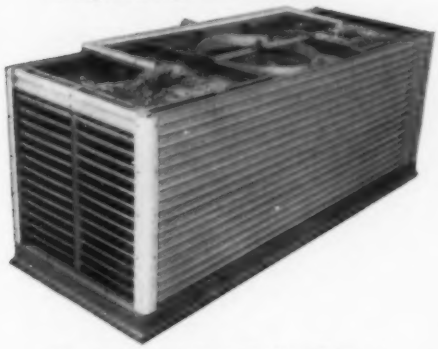
"No wonder you were so excited about this LoLine tower. Pritchard sure did go out of their way to make it a good one didn't they?"

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.



"Take a look at the fan assembly on this LoLine tower, Charlie."

Pritchard LO-LINE® Is Lowest Silhouette Tower of 75 Tons Capacity and Up!



The Pritchard LoLine Cooling Tower is the lowest (7' 7 11/16" over-all) tower of 75 tons capacity and up now available. The LoLine incorporates many features in its design which are unique in low silhouette tower construction:

1. Galvanized steel fan drive supports and basin accessories.
2. Grease fittings for bearings on V-belt drive are outside tower.
3. Corrugated asbestos cement board casing.
4. Asbestos cement board louvers are standard, not special equipment.
5. Internal pipe supply system. Piping is completely concealed. (Optional.)
6. V-belt drive has stainless steel fan shaft.

GET ALL THE FACTS!

Write today on your company letterhead for your copy of the LoLine Bulletin 5.1.902. It gives complete details on this new, low silhouette tower. No cost or obligation, of course.

INDUSTRY'S PARTNER FOR PROGRESS

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.

Dept. 473, 4625 Roanoke Parkway
Kansas City 12, Mo.

COOLING TOWERS * GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

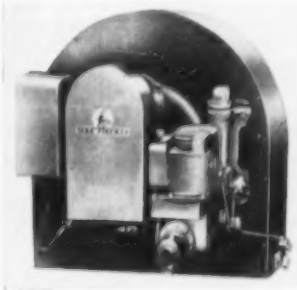
EQUIPMENT DEVELOPMENTS

Continued

Liquid Metal Pump . . .

. . . for temperatures to 1600 F—*Westinghouse Electric Corp., Dept. HPAC, 401 Liberty Ave., Pittsburgh 30.*

Is said to withstand such temperatures for extended periods. Rated 150 gpm at 285 ft head. Centrifugal unit has hermetically sealed canned rotor which contains pump and motor rotor in integral unit. Recommended by company for chemical process lines, nuclear applications, other uses requiring high temperature heat transfer mediums.



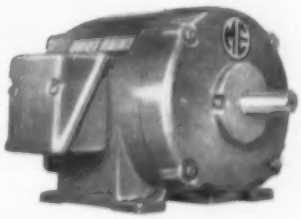
Oil Burners . . .

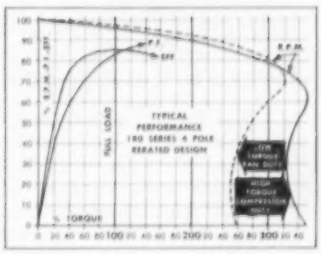
. . . for either natural or induced draft with approximately 0.10 to 0.15 in. WC required for full rating—*Iron Fireman Mfg. Co., Dept. HPAC, 3170 W. 106th St., Cleveland 11.*

Range in size 9 to 125 gph, all with integral air registers, firing No. 6 or lighter oil, says company. Electronic safety controls shut off burner if unsafe condition arises. Limit control operates burner to hold temperature or boiler pressure at necessary level.

Why Marathon ?

- **EXPERIENCE of PROVEN PERFORMANCE** . . . . over HALF A CENTURY. There is no substitute for the reliability of proven performance. Top Names of the Nation's Industry have proven ME performance in ENGINEERING . . . DESIGNING . . . PRODUCING QUALITY PRODUCTS
- **VERSATILITY** with a WIDE RANGE OF DESIGN. MOTORS 1/20 thru 2500 HP . . . GENERATORS 1/2 thru 2000 KW . . . Single Phase, Polyphase, Direct Current . . . Standard or Special . . . Marathon Electric can design to meet your special specifications.
- **SERVICE THROUGHOUT the NATION** MARATHON ELECTRIC has a DISTRICT OFFICE or Representative near you. Call your ME Representative TODAY to help solve your motor problem.





MARATHON RERATED NEMA FRAMES provide 4 in 1 PROTECTION

DRIP PROOF	WEATHER PROTECTED
SPLASHPROOF	GUARDED

MARATHON ELECTRIC'S new rerated NEMA frame design packs all these requirements into a single unit . . . Available in standard ratings for high torque-compressor duty or low torque-fan duty, or made to your specifications.

Write or Wire SPADE 71 for further information

SALES OFFICES IN PRINCIPAL CITIES

MARATHON ME ELECTRIC

HOME OFFICE AND FACTORY, WAUSAU, WIS.
FACTORIES AT ERIE, PA. AND FARLVILLE, ILL.

In the new Dallas Insurance Center . . .

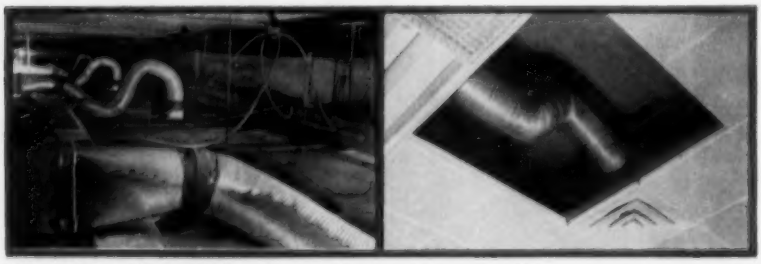
Flexible Thermaflex®

keeps floor plans flexible, too!

George L. Dahl, Architects & Engineers; O'Rourke Construction Co., General Contractor; United American Insurance Co., Owner—all of Dallas

Rigid ducting couldn't handle this job!

To allow for future rearrangement of offices, ceiling diffusers in the new Dallas Insurance Center had to be readily moveable! They are — because the architects and contractors installed flexible Thermaflex. Diffusers can be moved four feet in any direction without disconnecting Thermaflex — no complicated tearing out and refitting of rigid ducting will be needed.



You can see the flexibility assured by Thermaflex as runouts from main ducts to ceiling diffusers. This lightweight, durable, easy-to-handle metallic-laminate ducting is contributing a great deal to the usefulness of this new building over a long period of years. This installation is a conventional low pressure system. Thermaflex was used in 5", 6", 8" and 10" diameters. It is available in diameters up to 12 inches.

Laboratory tests have proved that Thermaflex will stand 1200° F. without any sign of combustion or melting — that it will stand pressure of 25 psi, which is 5x minimum standards of the New York Board of Standards and Appeals. Thermaflex bends around corners and obstructions with minimum friction loss . . . installs quickly and easily . . . eliminates costly elbows and special fittings.

Flexible Tubing

CORPORATION

GUILFORD, CONNECTICUT • LOS ANGELES 64, CALIFORNIA

Send the coupon today! Our engineers will show you how Thermaflex can save you up to 32% on installation costs.

Flexible Tubing Corporation, Dept. 7 Guilford, Connecticut
Please send me more information on Thermaflex.

Name_____

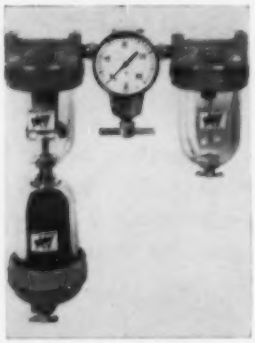
Title and Company_____

Address_____

City_____ Zone____ State_____

EQUIPMENT DEVELOPMENTS

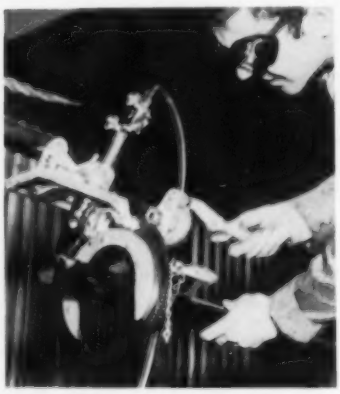
Continued



Air Control Assembly . . .

. . . designed to filter, regulate, lubricate compressed air used in operation of pneumatic equipment—*Airmatic Valve, Inc., Dept. HPAC,* 7317 *Associate Ave., Cleveland* 9.

Sludge, formed of dirt, scale, rust and moisture, automatically trapped by filter, says company. Drain trap attached to bottom of filter collects moisture from filter to eliminate periodic draining maintenance. After cleaned air is regulated to desired pressure, oil mist is added by lubricator.



Pipe Cutter . . .

. . . for small diameter pipe—*H & M Pipe Beveling Machine Co., Dept. HPAC,* 311 *E. Third, Tulsa, Okla.*

Employs split-gear horseshoe principle allowing operator to place machine on continuous pieces of pipe. Specially designed boomer strap is said to speed up process of changing machine from one piece of pipe to another. Any plain-barrel machine cutting torch may be used with the unit, says company.

Air conditioning keeps indoor climate clean, fresh, temperature-perfect at Norwich Pharmacal laboratory.

His comfort helps research improve your health

Here's how American Blower air conditioning equipment controls the climate in one of America's most modern research centers

Having developed such antimicrobial agents as the nitrofurans — widely used in the treatment of both human and animal diseases, and comparable to the sulfonamides and antibiotics — the Norwich Pharmacal Company promises even greater aids to healthful living through improved research at its new Melvin C. Eaton Laboratory, Norwich, N. Y.

Here, American Blower air conditioning equipment assures ideal working comfort in offices and laboratories . . . eliminates variable temperatures in research projects.

For example, in work with rabbits — which are affected by fluctuations in heating or cooling — temperature changes could distort the results of many months' research. *Temperatures in the laboratory never vary more than one degree.*

Norwich's chief engineer, Wm. Agnew, adds: "Our American Blower equipment not only provides dependable, quiet air conditioning, it also does an excellent job of dust filtering — essential in keeping test tubes, test plates uncontaminated."

If your plans include air conditioning, it will pay you to talk to an American Blower sales engineer. Just call our nearest branch office. American Blower Corporation, Detroit 32, Michigan; Canadian Sirocco Company, Ltd., Windsor, Ontario.

In addition to equipment for complete central systems, American Blower offers packaged air conditioners for offices, stores, small industrial plants and similar applications.

AMERICAN BLOWER

Division of American-Standard

Air conditioning equipment for every business

BY ACCURATE METERING

BUILDERS-PROVIDENCE Shuntflo® Meter helps you get accurate in-plant accounting for cost/tax purposes, detect leakage, and stop waste usage. Self-contained and self-operated . . . easily installed . . . accuracy ± 2% over wide range. NO STUFFING BOX!

FREE CATALOG available from **Builders-Providence, Inc.,** 381 Harris Avenue, Providence 1, R. I. Write today.

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PROVIDENCE, RHODE ISLAND
METERS FEEDERS CONTROLS

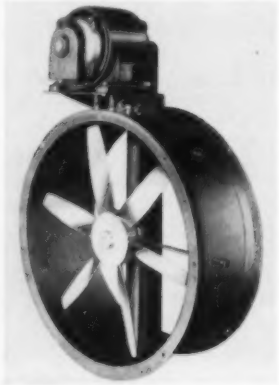
BUILDERS-PROVIDENCE, INC. • PROPORTIONEERS, INC. • OMEGA MACHINE CO.

EQUIPMENT DEVELOPMENTS
Continued

Cooling Towers . . .

. . . with automatic modulating valves —*Refrigeration Engineering, Inc., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles* 22.

Dampers provide method of adjusting capacity of unit to match capacity of compressor when system is operating at from full to minimum capacity. Towers blow air through unit instead of pulling air through fan section, eliminating saturated air from fan section, says company. Water bleed is said to assure positive, nonclogging action.



Tubeaxial Fan . . .

. . . for paint spraying booths, industrial ventilation, exhaust—*Peerless Electric Co., Fan and Blower Div., Dept. HPAC, W. Market St., Warren, O.*

Unit belt driven. Diameters match standard duct sizes. Both fan and motor fitted with ball bearings. Fan blades are nonsparking, heavy cast aluminum, says company. Single-phase motors are capacitor-induction

CLEAN AIR by AAF in Denver's Mile High Center

Airmat PL-24 Filters Supply 350,000 cfm on Year-round Air Conditioning System

Denver's Mile High Center. Architects: I. M. Pei & Associates; Kahn & Jacobs and G. Meredith Musick; Consulting Engineers: Jaros, Baum & Bolles; Severud-Elstad-Krueger.

Even Denver's famous clean, dry air wasn't good enough for the builders of the city's new Mile High Center. They proved that high style, public plazas, fountain-pools and year-round air conditioning (featuring *clean air)* add up to a good, sound, long-term business investment.

The Airmat PL-24 was selected from AAF's complete air filter line to do the important air cleaning job. It's the world's most efficient mechanical filter for ventilating and air conditioning service. It packs 28½ square feet of filtering area into a compact 2′ x 2′ x 8″ unit . . . . features low-cost renewable media and unit construction for simplified maintenance.

The unique design of the Center challenges accepted office building standards, but the reliance on Airmat PL-24 is nothing new. More than a *quarter-million* PL-24 units are now supplying business and industry with more than *300 million cfm* of clean air. For complete product information, call your nearest AAF representative or write direct for Bulletin 230.

AAF Dust Control Equipment

Illinois Steam Heating Specialties

AAF American Air Filter COMPANY, INC.
375 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

herman nelson

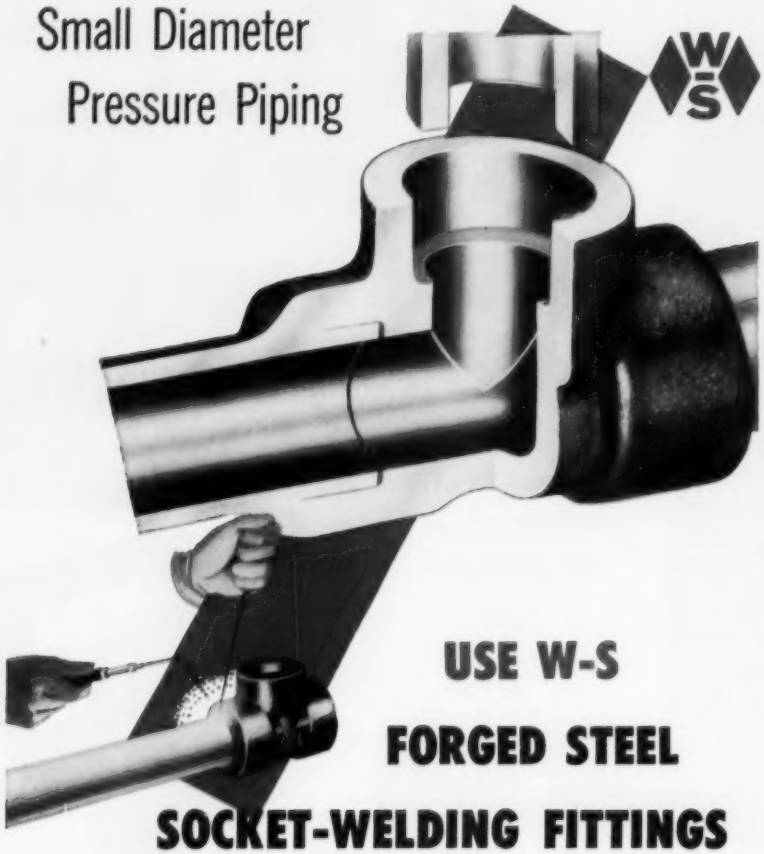
BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

Here's the **EASY WAY TO WELD**

Small Diameter Pressure Piping



USE W-S FORGED STEEL SOCKET-WELDING FITTINGS

In addition to providing high strength and toughness, W-S Forged Steel Socket-Welding Fittings are also easy to install. Deep sockets support and align the pipe for welding... eliminating the need for tack welding or special fixtures. No back-up ring is needed either. The fillet-weld is completely outside the pipe. Welding icicles just can't form inside the pipe. The result is a clean, tight welded joint that will readily resist high pressures and the stresses of shock and vibration. What's more, installation costs are lower.

W-S Socket-Welding Fittings are available in sizes ⅛" to 4" for schedule 40, 80, 160 and double-extra heavy pipe in carbon steel, stainless steels and alloy steels.

For complete information on the installation and operation advantages of W-S Forged Steel Socket-Welding Fittings, send today for Bulletin A-3-56.

W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

EQUIPMENT DEVELOPMENTS

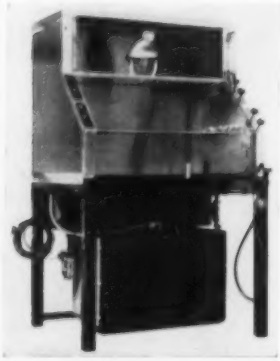
Continued

type; three-phase motors are induction type.

Air Wash Systems . . .

. . .engineered for integration into plant ventilation systems—*Automotive Rubber Co., Inc., Dept. HPAC,* 12550 *Beech Rd., Detroit* 39.

Are said to be capable of eliminating 90 to 99 percent toxic fumes, corrosives from exhaust gases. Rubber lined, acid resistant washers equipped optionally with straight-through air inlet and discharge; with bottom air inlet, top air discharge; with end inlet and end discharge and added downstream access hatch. Standard units available in capacities 7200 to 57,600 cfm.



Portable Hood . . .

. . .designed to remove acid vapors —*Yerzley & Co., Dept. HPAC,* 744 *Broad St., Newark* 2.

Requires no exhaust duct, operated wherever water drain, cold water, and electric power available, says company. Upper surface is said to provide high resistance to most inorganic, many organic chemicals, serve as gasket between lower edge of hood shell and base, says company.

THE ONE BEST SAFETY RELIEF!

for BIG hot water space heating boilers

230 M-1
Boiler size up to 1,488,000 Btu./hr. ¾" valve opens at 30 psi. 1½" valve opens at 36 psi.

230 M-2
Boiler size up to 1,928,400 Btu./hr. 1" valve opens at 30 psi. 1½" valve opens at 36 psi.

"Progressive settings" do the job!

Look at these dual relief valves in the McDonnell 230 series. They give you the Btu-rated, code-approved relief capacity required for big hot water space heating boilers . . . but they give you something more that can't be had in any other valves.

This something more is *progressive settings.* The smaller (primary) valve is set to open at the maximum hot water heating boiler pressure of 30 psi. The larger (secondary) valve is set to open at a slightly higher pressure—at 36 psi. This progressive setting is an exclusive McDonnell development that can eliminate a lot of service problems . . . and we'll tell you why:—

Notice "Operation Normal" The small valve, set at 30 psi, will take care of the duties of discharging excess water and reducing increased pressures due to causes such as thermal expansion, over-filling or pump impulse pressure. But since it is a relatively small valve it doesn't open up a big discharge as a large valve would. When a large valve opens, it really goes to town, as you know, and has more difficulty reseating tightly—a drawback that can lead to service calls and problems.

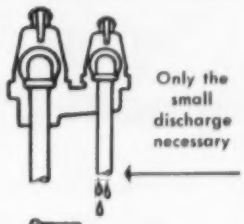
But now Notice "Operation Emergency" If an emergency high pressure condition occurs, the big valve opens with a pressure increase of only six pounds . . . and the combined capacity of both valves goes to work immediately.

The principle of progressive settings complies with the ASME boiler code. The valves used in the 230 M-1 and the 230 M-2 are the McDonnell 230 series valves which conform to ASME boiler code requirements and have been tested and rated by the National Board of Boiler and Pressure Vessel Inspectors.

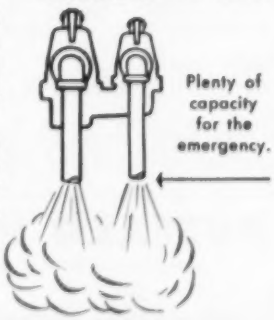
Use the smaller 230 series valves (opposite) for the smaller boilers; and remember that best modern practice dictates McDonnell boiler water level controls on hot water space heating boilers. Ask for complete information.

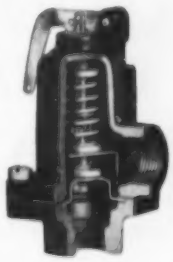
McDONNELL & MILLER, Inc.
3500 N. Spaulding Ave., Chicago 18, Ill.
Doing One Thing Well

OPERATION: NORMAL



OPERATION: EMERGENCY





McDONNELL 230 Series
your kind of relief valve—

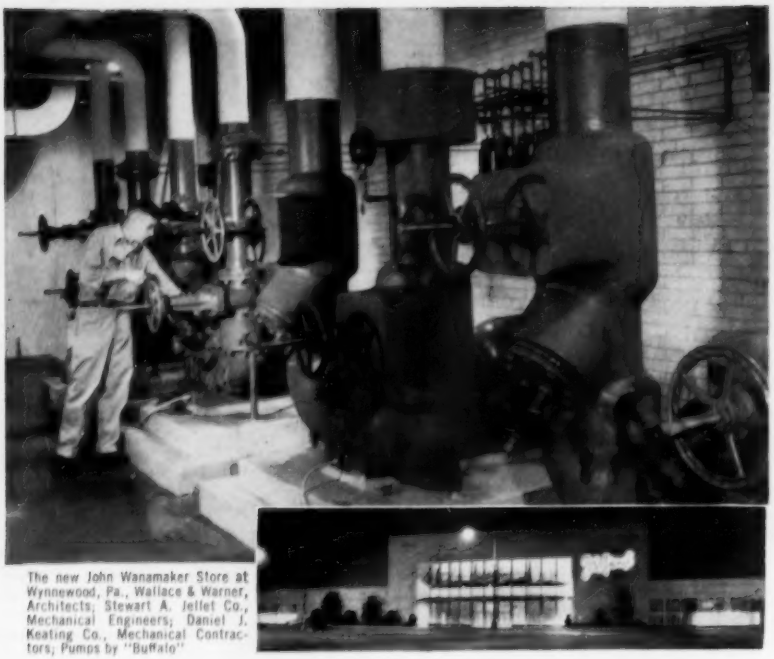
Ingenious design and ultra-modern manufacturing methods have combined to give you a thoroughly dependable relief valve at a modest price in the McDonnell 230 series.

Interior operating parts are all non-ferrous materials. Valve seat is brass; valve disc, durable Silicone. An outstanding feature is the independent action of the testing lever. Even tying it down does not interfere with the automatic functioning of the valve.

Tested, rated and approved, the name-plate of every series 230 valve carries these symbols:

V NB A.S.M.E. UV

McDONNELL *Boiler Safety Devices*



The new John Wanamaker Store at Wynnewood, Pa., Wallace & Warner, Architects; Stewart A. Jellet Co., Mechanical Engineers; Daniel J. Keating Co., Mechanical Contractors; Pumps by "Buffalo"

Chilled Water Handled by "BUFFALO" Pumps in new John Wanamaker Store

These five insulated "Buffalo" Double Suction Type SL Pumps keep chilled water on the move to serve the comfort requirements of the new John Wanamaker Store at Wynnewood, Pa. Four other "Buffalo" Pumps deliver condenser water to a roof cooling tower. Because the designers of this beautiful store realized the importance of the pumps in the system, they looked for pumps of unquestioned reliability — and chose "Buffalo", the name backed by 79 years of proved performance in every type of industrial and commercial installation. There's a "Buffalo" Centrifugal Pump for *your* job — ask your nearby "Buffalo" Engineering Representative for recommendations!

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo" PUMPS

BUFFALO PUMPS

DIVISION OF BUFFALO FORGE CO.

171 Mortimer Street Buffalo, N. Y.

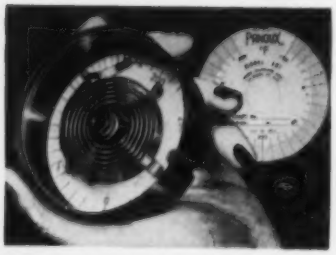
Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

EQUIPMENT DEVELOPMENTS

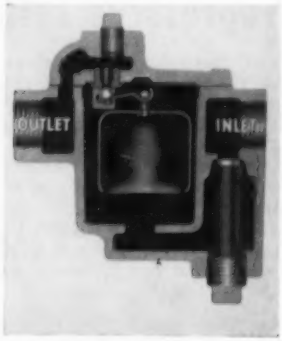
Continued



Thermometer . . .

. . . for maximum, minimum temperature recording—*Pacific Transducer Corp., Dept. HPAC,* 11836 *W. Pico Blvd., Los Angeles* 64.

Designed to measure ambient temperature, record lowest and highest values over given period of time. Feature replaceable paper chart on which record is made. Unit in 50 to 250 F or −50 to 100 C ranges.



Strainer Traps . . .

. . . with cast semi-steel construction—*Clark Mfg. Co., Dept. HPAC,* 1830 *E. 38th St., Cleveland* 14.

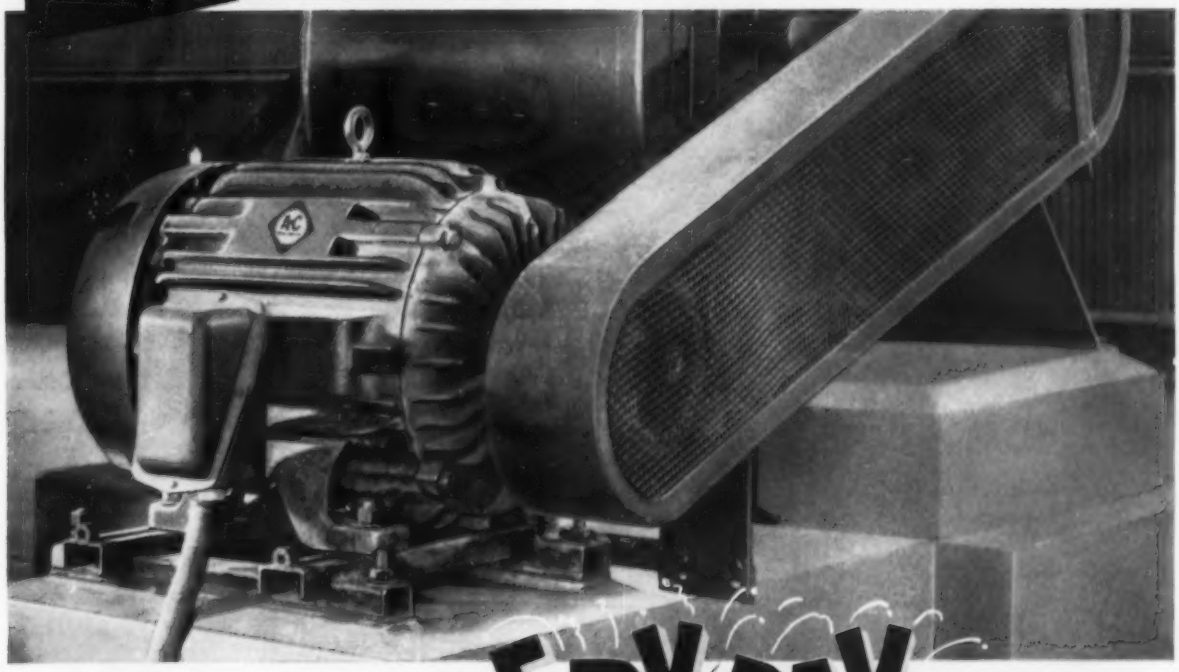
Combines fast, positive removal of condensate, built-in strainer for protection of equipment, says company. Equipped with standard or "Duo-step Leverage." Seats and discs corrosion resistant. For pressures to 250 psi, temperatures to 250 F.

Timing Instruments . . .

. . . for 120, 240, 480 volts, 25, 50 and 60 cycles—*John W. Hobbs Corp., Dept. HPAC, Springfield, Ill.*

Mechanism enclosed, sealed against dust, moisture, foreign matter, says company. Powered by synchronous motor. Equipment powered by a-c can be equipped with these instruments.

There's **MORE** Cooling Surface in these deep-ribbed **MOTORS**



No Day is FRYDAY

with these Allis-Chalmers MOTORS

● Frying of insulation is impossible under normal conditions with the extra-large cooling surface of Allis-Chalmers rib-type TEFC motors. The result—you expect and get longer motor life.

The engineered partner of A-C motors is Allis-Chalmers control.

Get Complete Information

As a new machinery component or as replacement, specify Allis-Chalmers. Discuss your particular application with your nearby A-C distributor, A-C district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

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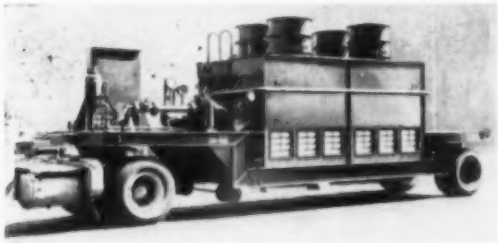
WHI-61

EQUIPMENT DEVELOPMENTS

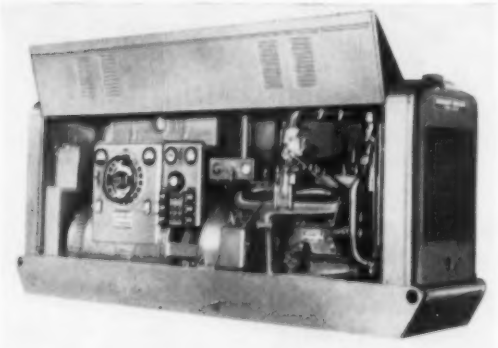
Continued



Cooling Tower . . .

. . . with portable design for industrial applications where limited cooling water supplies have slowed production—*Badger Mfg. Co., Dept. HPAC, 230 Bent St., Cambridge 41, Mass.*

Unit is packaged "plant on wheels" with pumps, strainers, electrical control equipment, pressure gages, thermometers, feed water conditioner. Design capacity is 240 gpm of 115 F water reduced to 90 F when operating at 95 F air temperature and 80 F WB, says company.



Welder . . .

. . . with current range hand wheel, volt-amp adjuster, welding cable connecting studs—*Hobart Brothers Co., Dept. HPAC, Hobart Square, Troy, O.*

Gasoline driven engine d-c arc welder uses 6 kw or 12 kw a-c auxiliary power. Full capacity, 110 or 220 volts power service, available in 300 and 400 amp size. When welder, power generator are in use at same time, 300 amp model can be used under combined load (d-c and a-c) 18 kw, the 400 amp model can be used under combined load (d-c and a-c) 24 kw, says company.

Pressure Reducing Valve . . .

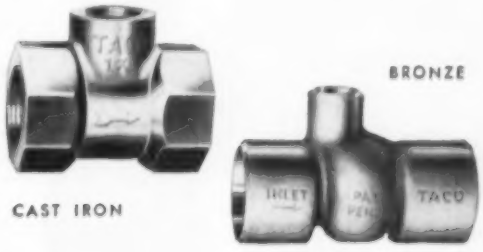
. . . for steam heat, process steam applications—*Leslie Co., Dept. HPAC, Lyndhurst, N.J.*

Air loader replaces loading spring. Valve has two moving parts, metal diaphragm with full valve travel and hardened stainless steel main valve that seats on renewable stellited seat ring. Available in cast iron in sizes ½ to 2 in. with screwed end connections.

Newest in a continuing line of product introductions from Taco, the Super Venturi Fittings with their higher capacities may be used in combination with Taco Standard Venturi's to reduce branch sizes. The result: definite cost savings with the use of one branch pipe size throughout most installations!

Particularly suitable for combination heating and cooling systems.

For full information on all Taco Venturi Fittings, write today for Technical Data Sheet.



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NEW "I-LINE" for EYE APPEAL

The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.

POWERFUL "VD" for HIGH VELOCITY

By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.

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Three types of Allen turbines take full advantage of the economy of natural air movement.

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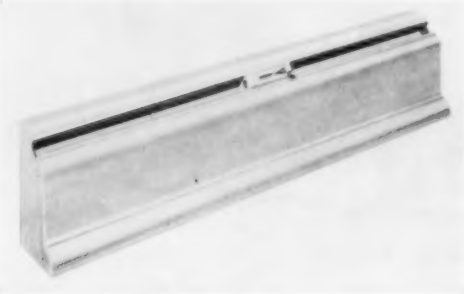
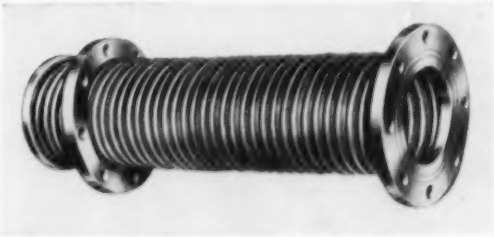
EQUIPMENT DEVELOPMENTS *Continued*



Baseboard Diffuser . . .

. . . with knockouts in ends to provide means of extension—*Kritzer Radiant Coils, Inc., Dept HPAC,* 2901 *Lawrence Ave., Chicago* 25.

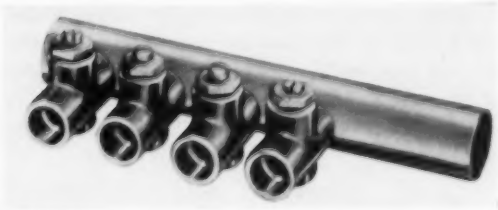
Damper performs dual function of balancing and shutoff blade, says company. Operated by lever action control. Construction is 20 gage, die formed sheets. Available in 2, 4 ft lengths.



Tubing . . .

. . . with standard 150 lb bronze flanges—*Seamlex Co., Inc., Dept. HPAC,* 4123 24*th St., Long Island City* 1, *N.Y.*

Seamless flexible bronze tubing suitable for conveying steam, water, air, transmitting vacuum, etc., says company. End connections of any type available. Principal applications: expansion and contraction compensators, vibration eliminators, misalignment equalizers. In standard stock sizes down to 1/16 in. ID.



Valve . . .

. . . for controlled hot water heating—*Econo Products Co., Dept. HPAC, East Haddam, Conn.*

"Zone-a-trol" reduces installation time, cost, says company. Of heavy duty copper tubing with all bronze balancing valves. Available in straight in-line models with from four to eight outlets in 1 and 1¼ in. sizes with either ⅜, ½, or ¾ in. outlets.

Have you tried PLASTIC pipe?

There are many plumbing and air-conditioning applications where you can reduce costs in time and material by using USS NATIONAL Polyethylene Plastic Pipe.*

YOU'LL SAVE TIME since it's so quick and easy to install. The long, continuous lengths of flexible polyethylene pipe require few joints, and those used are of the insert type, quickly secured with stainless steel clamps.

YOU'LL SAVE WORK since NATIONAL Plastic Pipe is so lightweight a 200-foot coil of 2-inch diameter can be carried on your shoulder.

YOU'LL SAVE MATERIALS since NATIONAL Plastic Pipe doesn't crack or break from rough handling, even at very low temperatures. And it retains its toughness and flexibility over its entire working range from minus 90°F. to plus 120°F.

YOU'LL ELIMINATE CORROSION. NATIONAL Plastic Pipe resists attack by acids, alkalis, alcohols, salts and other chemicals. Its smooth interior offers little flow resistance, thus preventing clogging and scaling.

ALL USS NATIONAL Plastic Pipe is manufactured from 100% virgin "on grade" polyethylene raw material. It imparts no taste or odor to the liquids passing through it.

USS NATIONAL POLYETHYLENE PLASTIC PIPE *is available in sizes from ½ inch to 6 inches in diameter, in a variety of wall thicknesses. For further information, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa. Ask for Bulletin No. 29.*

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NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS NATIONAL *plastic* PIPE

UNITED STATES STEEL

The Assumption Parish School, Richfield, Minn., employs the most modern development in heating and ventilating —recovery and re-use of inside air by means of activated charcoal filtration. In planning your next job, consider these important advantages:

MONEY and HEALTH FACTORS

Actual money savings on original equipment at the Richfield School totaled $12,000. (With activated charcoal to purify air, less outside ventilation is needed and a smaller system suffices.) Yearly operational savings are an estimated $1,650. Over-all savings, 30-year expectancy—$72,000. Air passed thru activated charcoal filters is clean and healthful. Odors and stuffiness are eliminated, all contaminants removed. Child health and alertness benefits —plus savings—are potent arguments for any school board.

The air recovery method and benefits described apply equally to heating-ventilating or air conditioning.

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Gentlemen: Please send me your bulletin: "Air Recovery in Churches and Schools."

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EQUIPMENT DEVELOPMENTS

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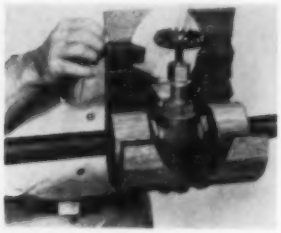
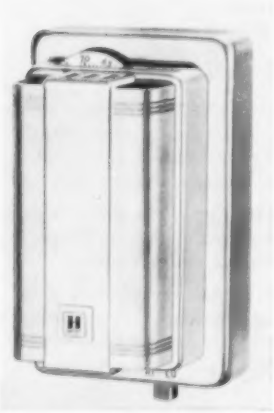


Pipe Insulation . . .

. . . for low temperature applications —*Armstrong Cork Co., Dept. HPAC, Lancaster, Pa.*

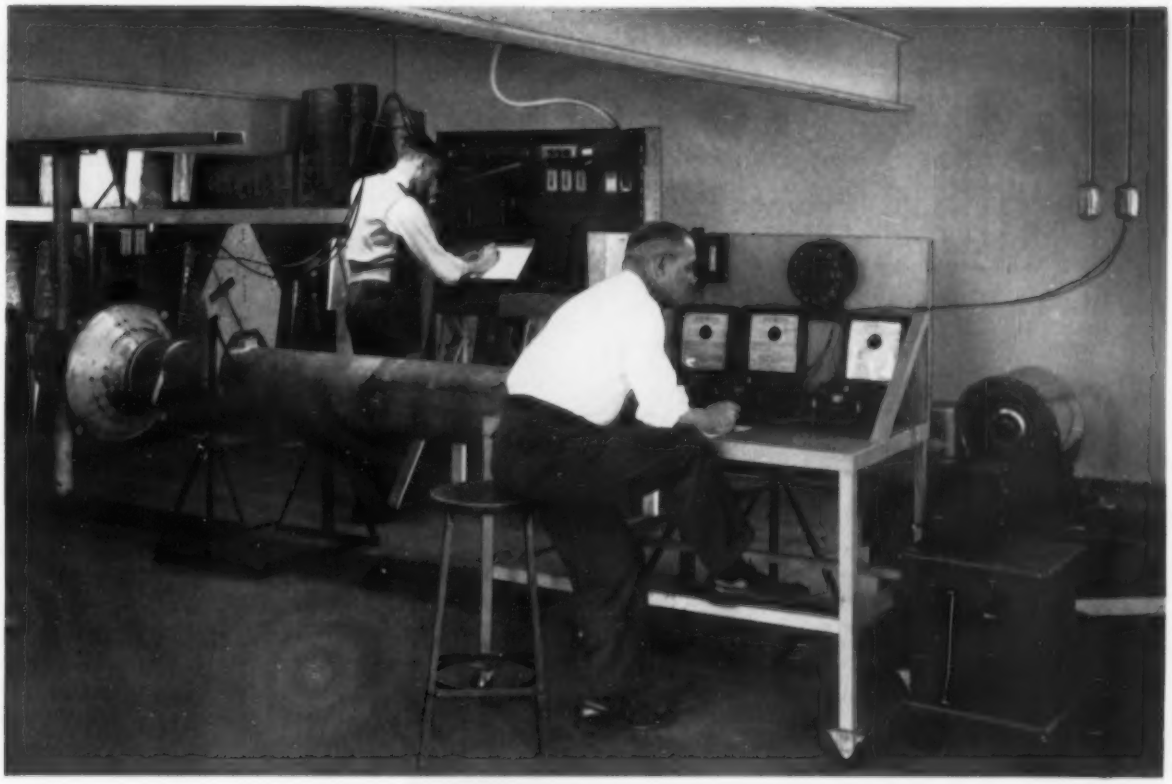
"LT" cork covering made from segments of cork board adhered to backing of asbestos, aluminum laminated paper. Applied by wrapping it around low temperature lines and using adhesive to seal lap. Can be reused, says company. Available for 30 F or higher, zero F, −30 F. For temperatures below −30 F special thicknesses are available on order.



Thermostat . . .

. . . designed to combine two thermostats and manually-operated high-low changeover switch in single instrument—*Minneapolis-Honeywell Regulator Co., Dept. HPAC, 2641 4th Ave., S. Minneapolis 8.*

For hotels, motels, other buildings requiring individual room temperature control during occupancy. High setting is adjustable between 67 and 75 F. Fixed 55 F is low setting. "T29B" can be used to control either electric radiator valves in individual room temperature installations or to monitor motors on zone valves.



An expanded Brundage service for engineering departments and manufacturers

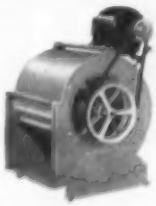
The terrific pace of the air conditioning and heating industry is creating formidable work loads for many engineering departments. In some cases, this causes bottle-necks . . . slowing down the marketing of profitable new products.

Brundage can help you solve this problem better than ever before.

Recent expansion has more than doubled Brundage design and testing facilities. This new capacity, combined with 35 years of experience in solving air moving problems, is at your service. If you want to put it to use on any question involving forced air, talk to your Brundage representative or contact Brundage, direct.

FREE BOOKLET,

"Blowers—and what makes them work better," gives practical installation and maintenance procedures. Write for your copy.



THE Brundage COMPANY
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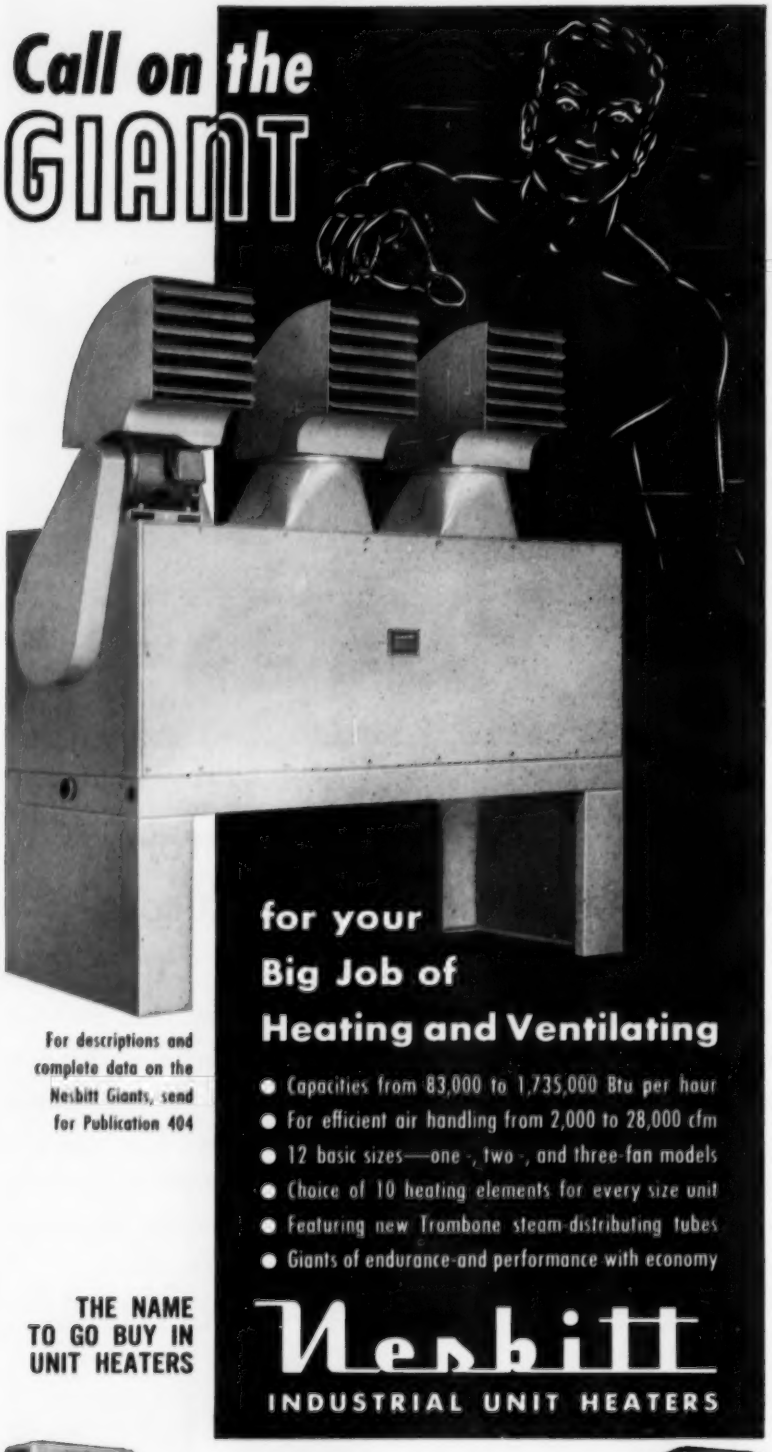
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Big Job of
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● Capacities from 83,000 to 1,735,000 Btu per hour
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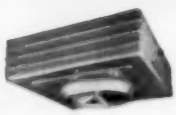

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SERIES C UNIT HEATERS

GAS FIRED UNIT HEATERS

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EQUIPMENT DEVELOPMENTS

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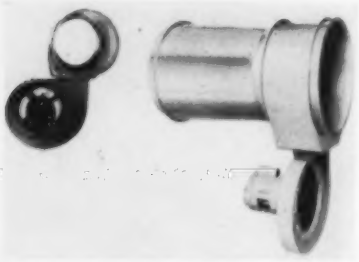
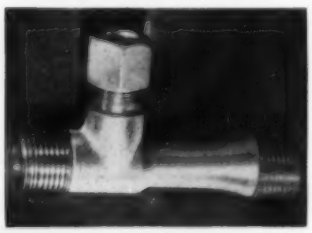


Power Exhausters . . .

. . . for use in industrial venting applications, commercial heating plants without exposing fan blades, motors to exhaust gases—*Quickdraft Co., Dept. HPAC, Dueber-Hampden Bldg., P. O. Box 87, Canton 1, O.*

Designed to direct injected air into conical jet that "pulls" exhaust gases into unit and "forces" them into atmosphere, says company. Fans and motors not exposed to abrasives, corrosive gases, smoke, noxious fumes, high temperatures, moisture and steam. In sizes 4 to 10 in. diameter; capacities 8460 to 60,000 cfh.



Ejector . . .

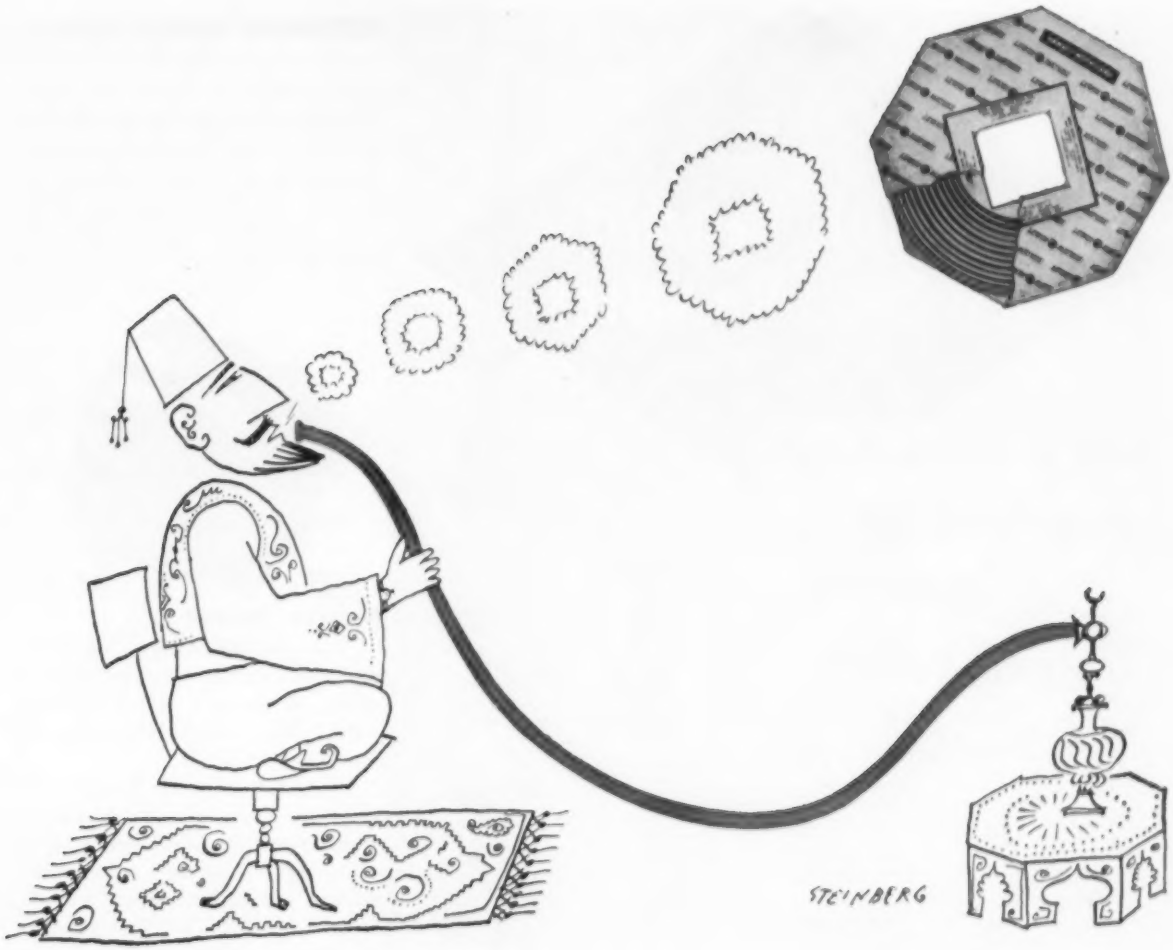
. . . for pumping, mixing, aerating liquids—*Bruner Corp., Dept. HPAC, 4763 N. 32nd St., Milwaukee 9.*

With forged brass body, removable brass nozzles. Operating flows range 0.8 to 2.4 gpm. In addition to four stock models, other combinations available for special applications, says company.

Sine Switch . . .

. . . with shock and vibration resistance—*Spencer Thermostat Div., Metals & Controls Corp., Dept. HPAC, 34 Forest St., Attleboro, Mass.*

Designed for applications requiring small movement differential with



pipe dream

No puffery is intended, but . . .

Twenty-five years ago we set out to make Lewin-Mathes Copper Tube and Pipe distinctive through superior quality and service.

In uniformity of product . . . Lewin-Mathes has achieved a standard of continuous quality control—from raw material to finished product—possible only in a *completely integrated* plant such as ours at Monsanto, Ill.

In packaging . . . the HANDIGRIP Carton, developed by Lewin-Mathes, pointed the way to similar containers for coiled tube now in general use.

And in distribution . . . our nationwide network of Service Offices and Mill Depots has earned for Lewin-Mathes a reputation for service and efficiency second to none.

What's *your* "pipe dream"? A new building? Improving your home? Producing a better product? If it calls for tube or pipe, be sure your architect, engineer or designer calls on Lewin-Mathes—the *integrated specialists!*

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KENNEDY *Quality* Low Pressure Valves

Set a New high standard of . . .

- *Performance*
- *Construction*
- *Dependability*

KENNEDY Low Pressure valves are manufactured of the same high quality bronze used in Kennedy 125 lb. valves. New, modern design for maximum strength with light weight; extra rigidity prevents distortion of the body when valve is being seated.

Each valve part is inspected seven times; each valve is subject to 300 lb. hydrostatic test; each low-pressure valve gets the same inspection as 125-300 lb. valve.

Easy installation of Kennedy Low-Pressure valves saves installation time, resulting in true economy.

These outstanding developments are what make Kennedy Low-Pressure Valves the Quality line.

Fig. 1
Designed for installation in steam and water lines where working conditions are not especially severe.

Fig 1SJ
For low pressure steam and 150 lb. water services at temperatures up to 250° F. (when joints are made up with ordinary solder.)

Fig 87
Made from the same quality materials as Kennedy Standard Valves, but for lower pressure services.

Fig. 104
For general service which is not severe. Swing disc on hinge is fitted with a stop to prevent sticking in the open position.

Fig. 5
For systems which require shut-off valves, where working conditions are not severe.

Fig. 9
For use on hot water radiator heating systems especially designed for ease of operation (open or close in one-quarter turn.)

WRITE TODAY for CHECK CHARTS

For Iron-Body and Bronze valves, show at a glance correct valve for various installations.

No obligation.

THE KENNEDY VALVE MFG. CO. • ELMIRA, N. Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

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EQUIPMENT DEVELOPMENTS

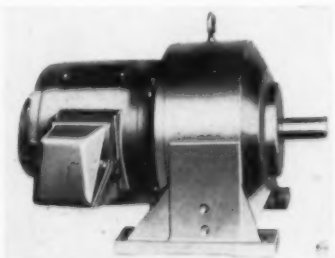
Continued

high resistance to shock and vibration. Features high current carrying capacity, small movement differential, superior shock and vibration resistance, long life cycling, and minimum effect from ambient temperatures, says company.

Blower Wheel . . .

. . . with wheel diameters 21 to 86½ in., both single-,double-inlet types—*Bishop & Babcock Mfg. Co., Dept. HPAC,* 4901-4915 *Hamilton Ave., N. E., Cleveland* 14.

Fabricated from die formed cast and spun parts, all welded and/or riveted into solid final assembly, says company. Reported to operate through temperature range −80 F (special steel) to 550 F. Maximum tip speed is 13,000 fpm.



Gear Motors . . .

. . . with two-way seals—*Reliance Electric & Engineering Co., Dept. HPAC,* 1088 *Ivanhoe Rd., Cleveland* 10.

Seals lock oil in and seal dirt out so that gear motors may be mounted in any position without oil leakage, says company. Induction hardening is said to provide hard tooth surfaces on tough alloy steel gears. Available in a-c and d-c, from 1 through 60 hp.

Even your tricky pipe racking is easier with UNISTRUT® channel

Typical service tunnel in large Midwest university

You make more money with UNISTRUT channel, too—by saving time, men and materials on this foolproof, superior method of pipe racking.

You start with everything you need—channel, clamps, hangers, concrete inserts, rollers or any other accessories. Everything is provided by UNISTRUT from standard stock.

Next, you forget about drilling, welding or riveting. With UNISTRUT, you simply cut the channel to length...slip the UNISTRUT nut in the channel slot...and tighten with a wrench. That's it!

Correct slope or pitch? No problem at all with UNISTRUT—it's completely adjustable. Future alterations or additions? With the flexible UNISTRUT System, you can make them any time.

Study these advantages a few moments—and you'll see why thousands are switching to the modern, high-speed UNISTRUT System for superior support of steam, gas, light conduit, air conditioning or heavy water lines. Get the facts now! Write for 78-page illustrated Catalog 700 giving complete information. Consult your telephone directory today for the name of your nearest UNISTRUT Distributor.

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THE DUAL PURPOSE PUMP

SUMMER The TVC Pump disposes of the condensate resulting from the moisture removed from the air by the air conditioner.

WINTER The TVC Pump returns the steam condensate to the heating plant.

Figure 320 illustrates simple piping hookup with a unit used for air conditioning in the summer and heating in the winter. This type of unit is efficient, economical and easy to maintain.

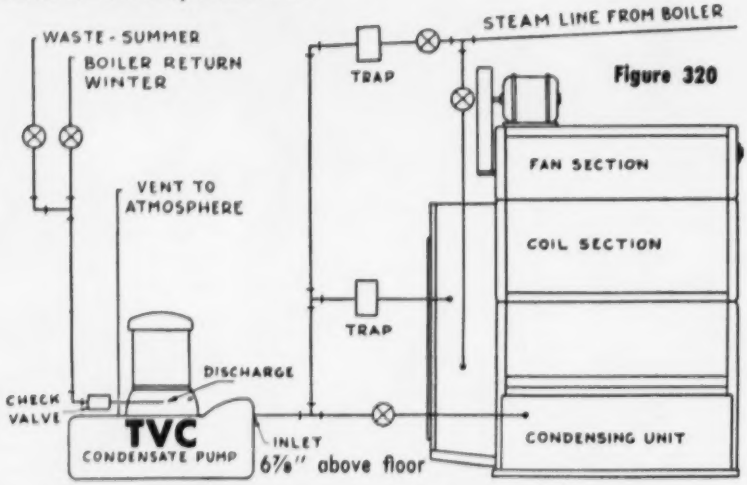


Figure 320

The weil TVC PUMP is the answer

VERY LOW RETURN CONNECTION – 6⅞"
Makes pump adaptable to any installation

LOW SPEED (1750 RPM)
Assures long motor life

CAST IRON RECEIVER – 21" DIA.
Does not rust out – last for a lifetime

CAPACITIES
500 to 10,000 sq. ft. E.D.R.
10 to 30 lbs. P.S.I.

ECONOMICAL
Bronze casing and impeller, stainless steel shaft and brass strainer guarantee years of trouble-free service

FACTORY ASSEMBLED
Ready for immediate installation

AVAILABLE FROM JOBBERS' STOCKS

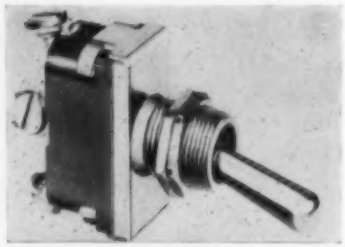
Send for Bulletin TVC-300

weil PUMP COMPANY
1514 No. Fremont St., Chicago 22

weil Dependable PUMPS

EQUIPMENT DEVELOPMENTS

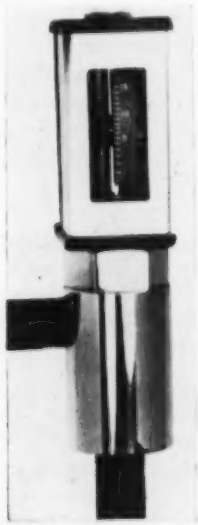
Continued



Toggle Switches . . .

. . . designed for a-c operation—*McGill Mfg. Co., Inc., Dept. HPAC, Electrical Division, Valparaiso, Ind.*

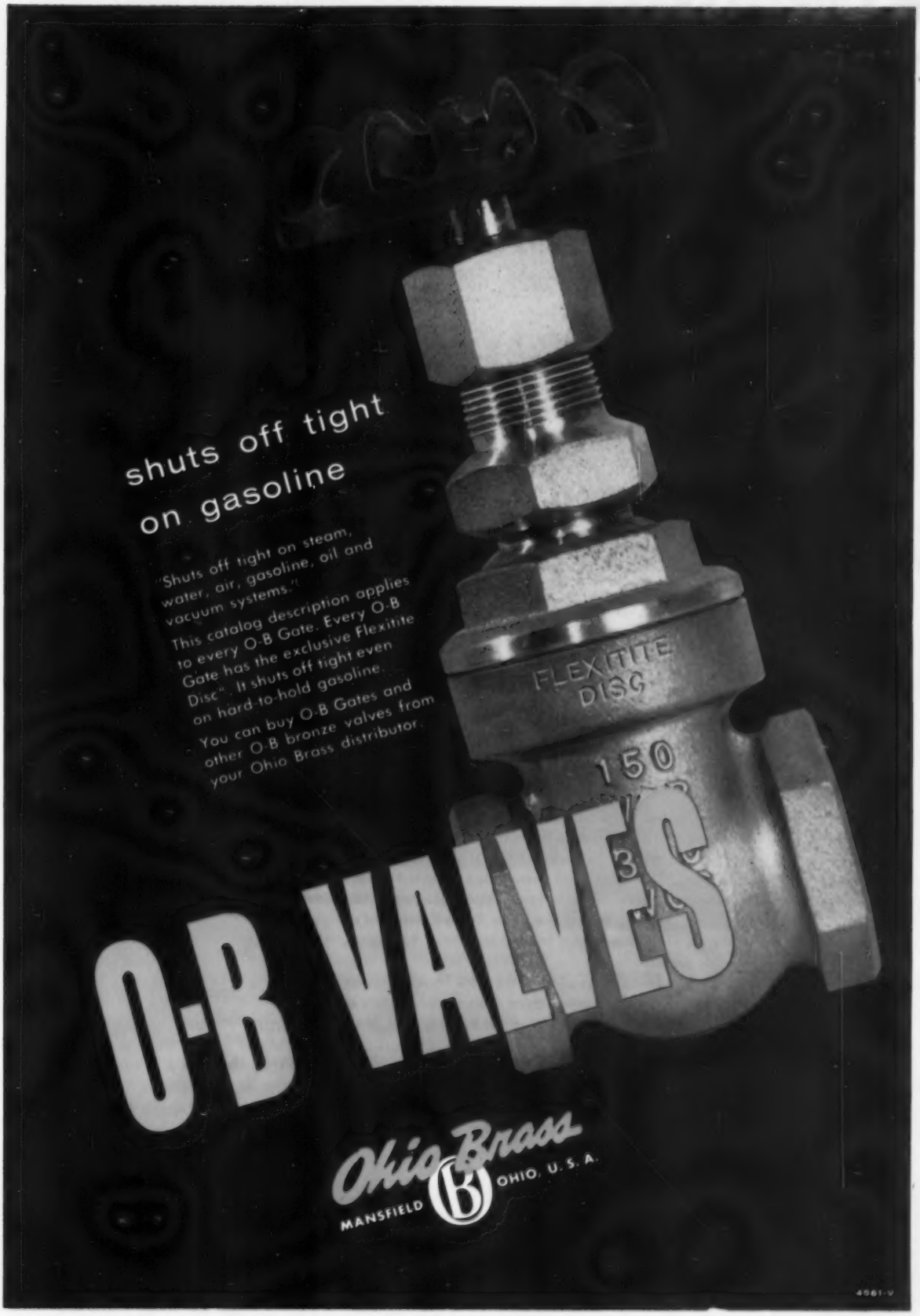
Available in three switching arrangements: single-pole, single-throw for on-off operation; two-circuit, single-pole, double-throw with center "off" position; two-circuit unit which throws directly from one circuit to another with no "off" position. Rated for ¾ hp, 15 amp service at 125 volts, or 10 amps at 250 volts. ½ in. wide, ½ in. thick, 1 1/8 in. long.



Flow Indicator . . .

. . . designed to handle hazardous fluids at pressures to 1500 psig, temperatures to 400 F—*Brooks Rotameter Co., Dept. HPAC, Lansdale, Pa.*

Standard flow rates 1.5 to 180 gph of water provided in single meter body by five plug and orifice sets. No glass parts in contact with fluid, positive o-ring seal eliminates stuffing boxes, says company.


shuts off tight
on gasoline
"Shuts off tight on steam, water, air, gasoline, oil and vacuum systems."
This catalog description applies to every O-B Gate. Every O-B Gate has the exclusive Flexitite Disc*. It shuts off tight even on hard-to-hold gasoline.
You can buy O-B Gates and other O-B bronze valves from your Ohio Brass distributor.
FLEXITITE DISC
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O-B VALVES
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MANSFIELD
OHIO, U. S. A.
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KORFUND
VIBRATION CONTROL

1500 Massachusetts Ave. Corp.—Owner
Ring Engineering Co.—Builder
F. Wallace Dixon—Architect
Karsunky, Walter & Gooch—Consulting Engineers
Standard Engineering Co.—Mechanical Contractor

lets you

PUT 'EM ON THE ROOF!

The roof, or an upper floor, is the best place for heating and air conditioning equipment, keeps basements free for other revenue-producing uses such as parking, storage, etc.

Korfund Vibration and Noise Control units let you install heavy boilers, compressors, fans, etc., without transmitted vibration to floors below. The photograph shows a boiler being hoisted to the roof of the 8-story 1500 Massachusetts Ave. apartments in Washington, D. C. The completed installation, which included Korfund-mounted boilers, pumps, compressors and fans, has been in operation for well over a year now, and the tenants on the floor immediately below don't even know of the existence of the equipment immediately over their suites.

This is just another example of the effectiveness of Korfund units. Their efficiency did not come about by accident — it's the result of more than a half-century of experience in the vibration and noise control field. Why not put this experience to work for you?

Write for a copy of the booklet, "Air Conditioning Goes Up in the World," which describes Korfund's role in vibration and noise-free upper floor installations. We'll also include a copy of "Vibration Control Specifications for Air Conditioning Equipment." Ask for Bulletin 31.

For specific recommendations contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

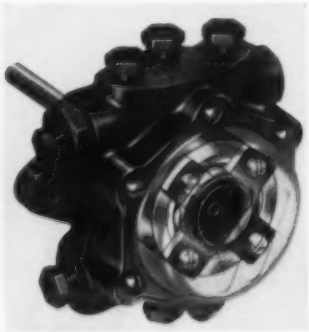
48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

EQUIPMENT DEVELOPMENTS
Continued

Air Conditioners . . .

. . . in 3, 5, 7½ 10, 15 hp models—*Koch Refrigerators, Inc., Dept. HPAC, 201 Funston Rd., Kansas City 15, Kansas.*

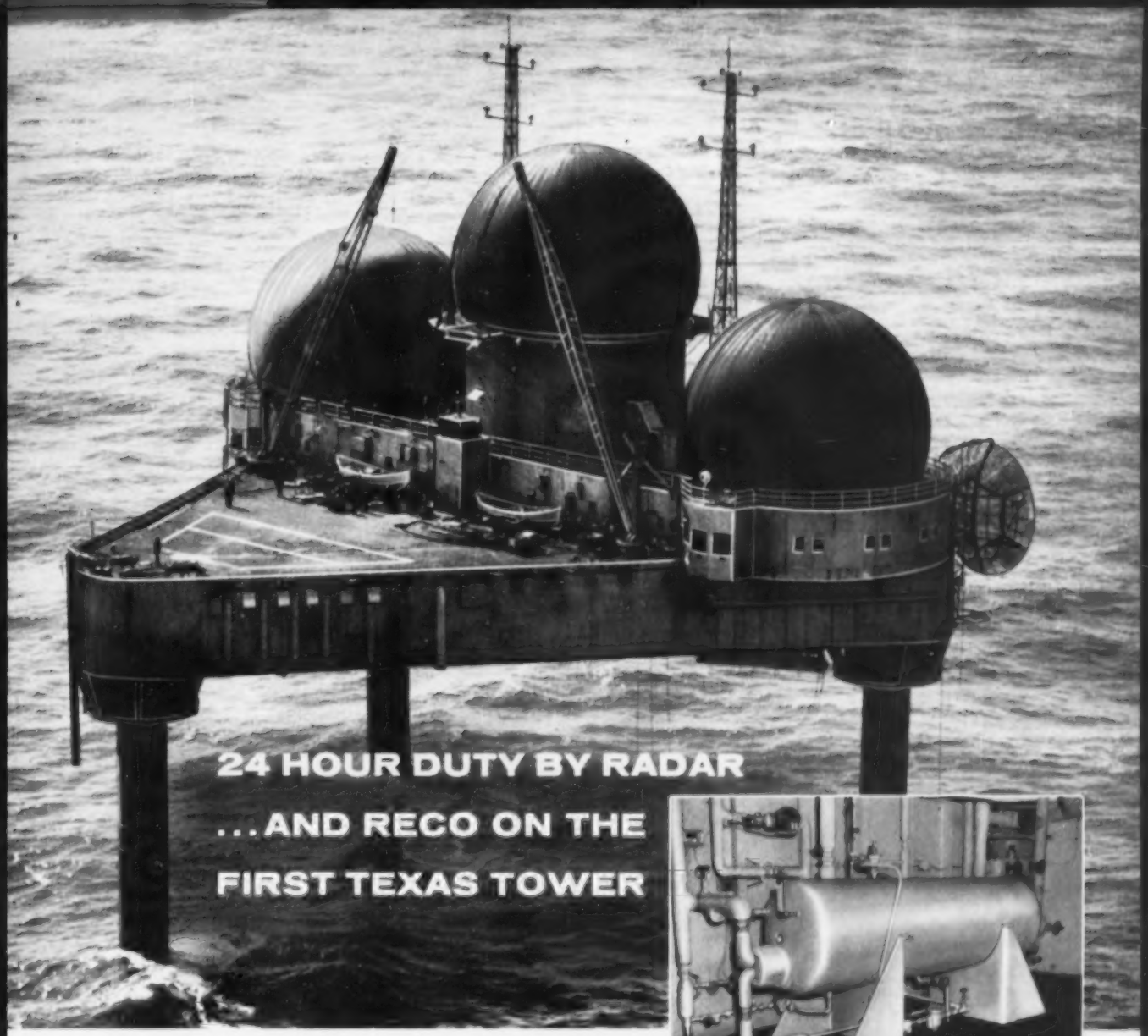
Grille in plenum equipped with individual adjustable louvers so that air can be directed up, down, or to either side. The 3 and 5 hp models may be furnished either single or three-phase; others are three-phase, provide ventilating fan for use in mild weather, full-power cooling system for very hot weather. Heating coils optional.



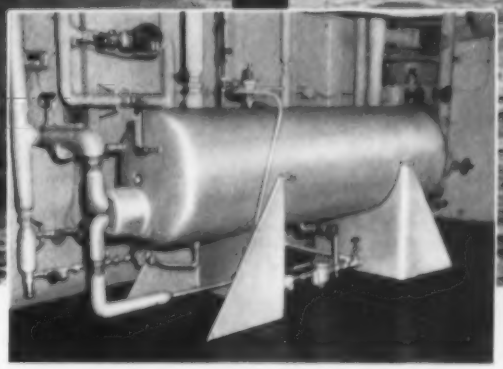
Fuel Unit . . .

. . . for oil burners, designed with self-cleaning rotary filter—*Webster Electric Co., Dept. HPAC, Clark & DeKoven Aves., Racine, Wis.*

Filter has particle discrimination of 125 microns, says company. Sump is provided in cover of pump to collect foreign matter rejected by filter. Is said to be adaptable to any heating system.



24 HOUR DUTY BY RADAR ...AND RECO ON THE FIRST TEXAS TOWER



U.S.A.F. "Texas" Radar Tower—Architects & Engineers: Anderson-Nichols & Co., Boston—Foundations: Moran, Proctor, Mueser & Rutledge, N.Y.—Contractor: Bethlehem Shipbuilding Co., Quincy, Mass.—Marine Contractor: Raymond-De Long, N.Y.

Somewhere off Cape Cod the first Air Force Radar island, called the Texas Tower, keeps a constant vigil against sneak enemy air attacks. Every piece of equipment on this steel island is on 24-hour duty. There's no let-up in demands. No time for breakdowns. Every item must work at peak efficiency around the clock—around the calendar.

RECO was picked to provide hot water for the tower's fifty man crew. A 30"x108" RECO Hot Water Storage Heater supplies 330 gallons of 140°F hot water per hour—24 hours a day—365 days a year. Galvanized against corrosion, this RECO Hot Water Storage Heater gives top service.

You can have this same round-the-clock reliability with RECO Heat Exchangers. Plus the RECO *guarantee* of top quality, competitive price, and quick delivery.

RECO's full line of Hot Water Storage Heaters, Convertors and Instantaneous Heaters is recommended by leading engineers, contractors and architects throughout the 48 states.

Let RECO fill your hot water needs, too. On your next job—

Richmond Engineering Co., Inc.
Dept. G, 7th & Hospital Sts.
Richmond 5, Virginia—Phone 7-2611

Please send:

- ☐ Free set of Heat Exchanger Catalogs
- ☐ Name of nearest RECO Representative

TO:_____

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SPECIFY RECO

1906

The open trolley car was a popular engineering contribution to summer-time comfort and pleasure. 1906 marked the introduction of the first Brunner-engineered product.

TODAY

Brunner "engineering for comfort" opens the door to more air conditioning sales in the future

... with the newly-designed BAC "packaged" models, and a complete line of open-type condensing units.

BRUNNER MANUFACTURING COMPANY, UTICA, N. Y.
THE BRUNNER CO., GAINESVILLE, GA.
IN CANADA: BRUNNER CORP. (CANADA) LTD., TORONTO, ONTARIO

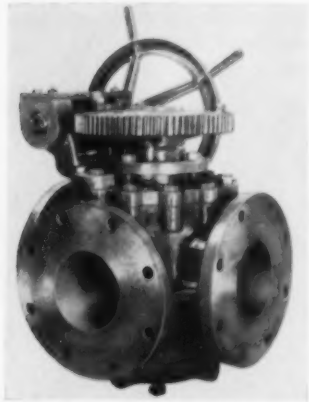
PROVEN QUALITY
50th Anniversary
BRUNNER
SINCE 1906
DEPENDABLE

New BAC "packaged" models are available in 3, 5, 7½ and 10 H.P. sizes. Smaller and more compact, these new units are attractively finished in Hammertone Green.

Open-type Condensing Units available in a wide range of sizes . . . ¼ through 100 H.P.

EQUIPMENT DEVELOPMENTS

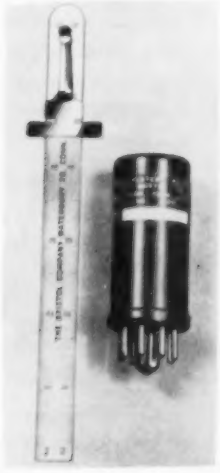
Continued



Jacketed Plug Valves . . .

. . . with optional worm gear operation — *Parks-Cramer Co., Dept. HPAC, Fitchburg* 17, *Mass.*

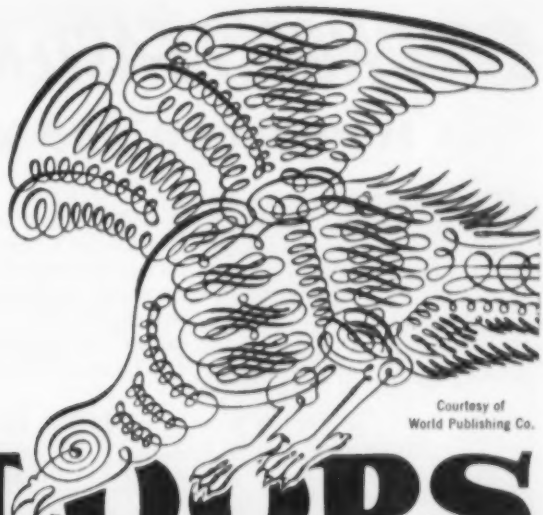
Features increased stuffing box depth, adjusting screw with thrust ball on which plug rotates, raised jacket tappings permitting use of street elbows providing the right angle turn necessary when jumpovers are made and eliminating use of nipple, elbow, says company. Available in 3 to 8 in. line size with two-, three-way types.



Relay . . .

. . . for dry circuit, low power applications—*Bristol Co., Dept. HPAC, Waterbury* 20, *Conn.*

Cited characteristics: temperature range, −55 to 100 C; contact rating up to 28 volts, 200 ma; pull-in time 200 microseconds; drop-put time, 300 microseconds; stray contact ca-



Courtesy of World Publishing Co.

LOOPS are for the birds-

Bending a line into loops to decorate documents became a highly developed art form in 17th Century England.

Bending a line into loops to absorb compressor vibration was accepted practice for years in our AIR CONDITIONING and REFRIGERATION INDUSTRY.

BUT—as equipment was improved installations grew smaller and engineers discovered that flexible hose absorbed this vibration in far less space and with far greater efficiency than any other method devised.

PACKLESS® Vibration Absorbers

absorbs *more* vibration in *less* space by spirally corrugating the wall of seamless drawn tubing, allowing fluid or gas to follow a direct course while absorbing vibration en route.

One piece, leak tite construction provides long service under rough conditions where welded or crimped construction fails (and must be replaced).

Available for pressures to 15,000 lbs., in stainless or carbon steel, and bronze. Standard or special fittings as required.

Consultation and design engineering for *your* specific requirements offered at no extra cost.

SEND NOW

for your copy of Bulletin VA-3 or contact us direct. Your inquiries will receive immediate attention.

PACKLESS METAL HOSE INC.

31-12 Winthrop Ave., New Rochelle, N. Y.

STRONGEST FASTENATION

at Hollywood and Vine...

A dozen floors above the street, in America's new Tower of Music, this workman anchors steel channel as easily as squeezing a trigger—driving fasteners straight, deep and powerfully into solid concrete with the RAMSET® DUO-JOBMASTER.

Complete flexibility with DUO-JOBMASTER

Both ¼" and ⅜" fasteners are set with the same tool, the new RAMSET DUO-JOBMASTER. It's the famous RAMSET tool with two interchangeable barrels—to handle *every* fastening job with any style or length fastener.

THE CAPITOL TOWER, spectacular new home of hi-fi Capitol records, dominates the heart of Hollywood, California.

First circular office building in the world, it was designed by architect Welton Becket; contractor is C. L. Peck. The $2 million structure is 13 stories high, acoustically engineered for minimum sound disturbance; has underground reverberation chambers with foot-thick concrete walls buried 25 feet into the earth.

NEED A KILN GUN?

Designed to dislodge clinker rings from rotary kilns, Western's Kiln Gun (now sold by Ramset) removes all types of stubborn, inaccessible obstacles. Write for complete details.

No matter what the construction problem, if it requires fastening to steel or concrete, RAMSET will do it better, faster, cheaper. Ask for new free catalog, just ready for you.

Ramset Fastening System
WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

12109-G BEREA ROAD • CLEVELAND 11, OHIO

EQUIPMENT DEVELOPMENTS

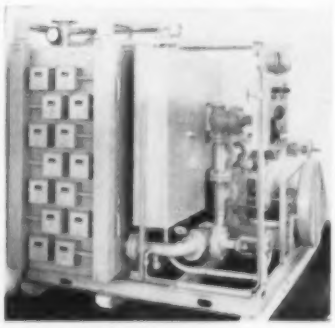
Continued

pacitance, less than 15 mmfd, says company. Relay is said to be unaffected during shock of 30 G, vibration of 10 G.

Water Mixer . . .

. . . designed to blend hot water with cold to produce 140 F final temperature—*Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

Body is of heavy forged brass, tappings are ½ in. IPS. Solid type thermostatic expansion element used. Working parts corrosion resistant. Not adjustable in the field. "D-100" can be used to obtain two different water temperatures from single water heater, says company.



Hot Oil Systems . . .

. . . designed to produce oil temperatures within 150 to 600 F range at low pressure—*Parks-Cramer Co., Dept. HPAC, Fitchburg, Mass.*

Electrically heated system completely assembled as packaged unit. Ready for immediate service when connected to tanks, kettles to be heated, says company. For heating of individual tanks or as central station system for number of tanks.

This "OGRE" can ruin a hot underground piping system that is turned on and off!

Let's look beyond just the initial cost of installing an underground piping system!

Consider for a moment how this system, once installed, will react to the thermal shock of turning it *on* and *off* (and what system isn't turned *on* and *off* occasionally). Unless the system is inherently capable of withstanding the shock of *on* and *off* service . . . that's when the "Ogre of Corrosion" swiftly becomes a real threat . . . and it costs *you* money!

Ask your Ric-wiL representative to explain how a Ric-wiL system protects you against *on* and *off* thermal shock.

Write for the *NEW* Ric-wiL Catalog or phone your Ric-wiL representative for a copy.

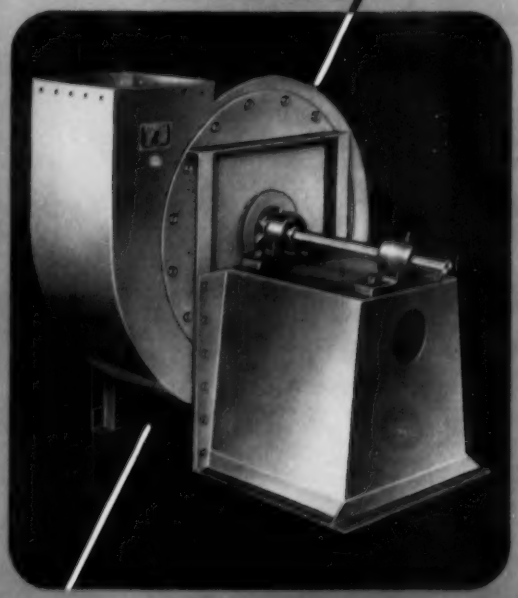
Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

Ric-wiL INCORPORATED — PREFABRICATED **INSULATED PIPING SYSTEMS**

BARBERTON, OHIO

Representatives in Principal Cities

ALADDIN FANS



Type "EX" INDUSTRIAL EXHAUSTERS

- RUGGED
- EFFICIENT
- DEPENDABLE

ALADDIN Industrial Exhaust Fans are ruggedly built and are especially suited for material handling or fume exhaust applications. They are ideal for removing dust from grinding wheels, conveying materials such as grains, shavings, sawdust, or the removing or handling of fumes, hot air or gases.

Units are all-welded steel plate construction . . . and are available with interchangeable "AR" Air Rotors, "MR" Material Rotors or "OR" Open Rotors.

WRITE FOR COMPLETE DATA

ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 • SAN LEANDRO, CALIF.
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST

EQUIPMENT DEVELOPMENTS *Continued*

Equipment Briefs . . .

INSULATION in one continuous strip 750 ft long —*Infra Insulation, Inc., Dept. HPAC,* 525 *Broadway, New York* 12. Multiple aluminum insulation installed in one piece without breaking to facilitate more complete heat, vapor protection in new, existing buildings, says company. Made for 12, 16, 20, 24 in. beam centers. Can be combined to accommodate 30, 48, 60 in. and wider centers.

LEVEL designed for wide application by steam fitters, steel construction men, others—*Stanley Tools, Dept. HPAC, New Britain, Conn.* Leaves both hands free to work since unit is equipped with magnet which holds it in place on ferrous surfaces. Holds indefinitely, contact with metal does not weaken magnet, says company. Has plumb, level, 45 deg glasses.

FORGED STEEL FITTINGS for high pressure service now shipped in triple-reinforced cartons—*W-S Fittings Div., H. K. Porter Co., Inc., Dept. HPAC,* 300 *Park Ave., New York* 17. Cartons replace former wooden crates. Are said to be light and compact, yet strong enough to take abuse.

CABLE SPACING GUIDE for use by contractors in installing ceiling heating cable—*Sunwarm, Inc., Dept. HPAC, Kingsport, Tenn.* Pocket-sized plastic guide gives net square feet for any size room 4 × 4 ft to 20 × 25 ft, shows correct spacing for radiant heating cable of varying wattages 400 to 4400, says company.

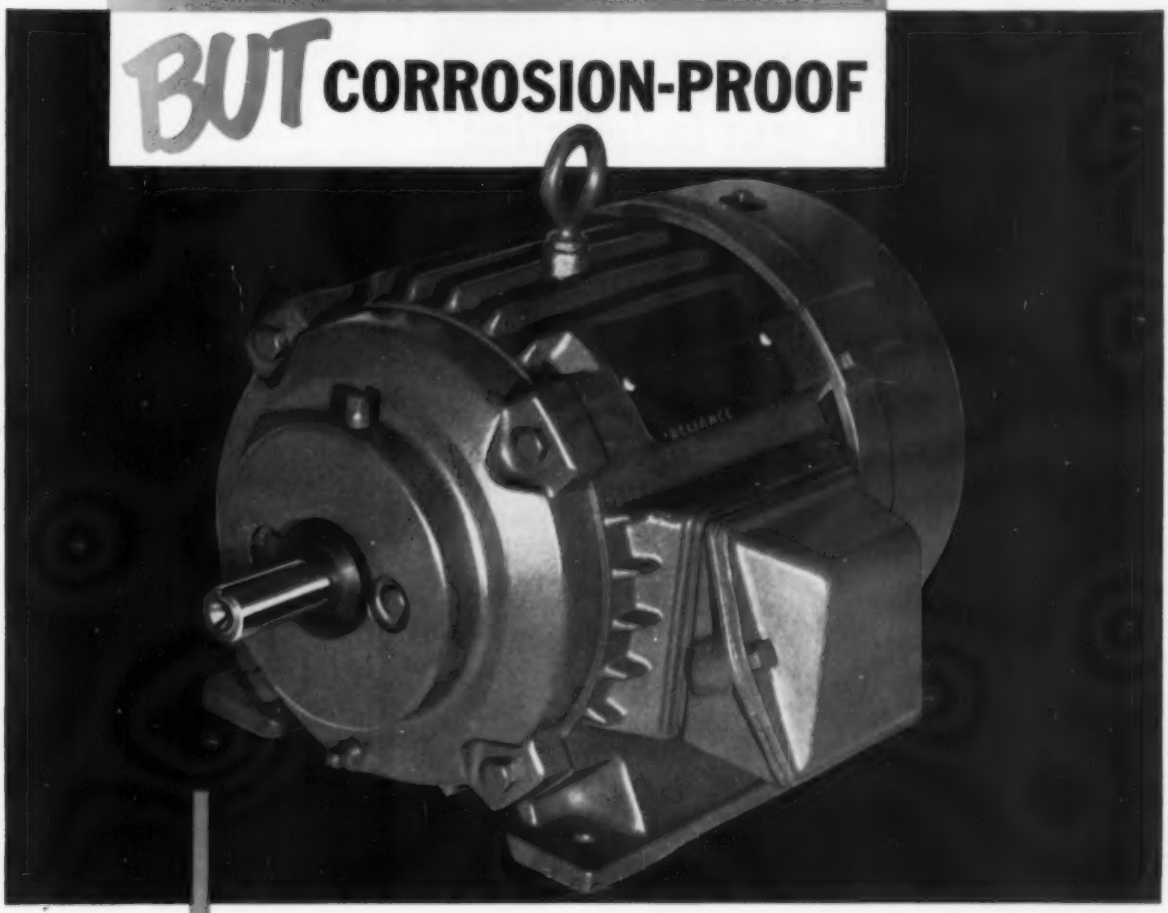
OILING SYSTEM for single, multiple bearing points in fans, heaters, etc.—*Trico Fuse Mfg. Co., Dept. HPAC,* 2948 *N. Fifth St., Milwaukee* 12. Hand pump pressure system designed for use in hard-to-get-at places. Pressure pump built into 4 oz shatterproof reservoir.

GASKET CUTTER with lightweight phenolic body, steel blades, inch and metric scales designed for high accuracy—*Cincinnati Tool Co., Dept. HPAC, Cincinnati* 12. For cutting round gaskets ¼ to 6 in., odd shapes and straight pieces any size, says company.

CEMENT for on-the-job lining of plain steel water heaters, storage tanks—*Pocono Fabricators, Inc., Dept. HPAC, East Stroudsburg, Pa.* "C-17 Pte-Krete" is said to double life of heaters, tanks by halting corrosion. Resists thermal shock, shrinking and cracking at high and low temperatures, company reports. ⫩

Not Just CORROSION-RESISTANT

BUT CORROSION-PROOF



Corrosion resistance is not enough to stop acids or alkalies from chewing up a motor in a hurry. That is why the wise engineer selects Reliance Corrosion-Proof Motors for corrosive service.

These motors are built to withstand the onslaught of destructive chemicals for years. Housings are made of virtually indestructible cast iron. Exterior contours are designed to slough off liquids—no nooks and crannies to retain corrosive elements. Enclosures are sealed to prevent any leakage . . . Metermatic lubrication systems provide complete protection against burned out bearings and contaminated lubricants.

Anyway you look at them, Reliance Corrosion-Proof Motors can take it—and you're not limited in the choice of motors either. A complete line of a-c. motors, 1 thru 300 hp., is available in all mountings, frequencies and voltages.

Why not call your Reliance representative today and get all the details.

B-1505

RELIANCE Totally-Protected MOTORS

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 367A, CLEVELAND 10, OHIO CANADIAN DIVISION, WELLAND, ONTARIO

Sales Offices and Distributors in Principal Cities

Which of these
NEW PETROMETER
Liquid Depth Gauges
best suits your installation?

You can obtain new Petrometer Series 1400 Remote Reading Tank Gauges in 4 Models to suit almost every industrial installation. All gauges operate on the sound principle of hydrostatic pressure . . . no moving parts or intricate mechanisms to cause failure through wear, corrosion or friction. Large, vertical scale gives accurate, easy-to-see readings.

Gauges can be installed on tanks above or below the ground and up to ¼ of a mile away.

CHOOSE FROM THESE 4 MODELS

MODEL 1400 A

Equipped with aerating valve for semi-automatic purging of the transmission line. Purging line attaches to compressed air line.

MODEL 1400 B

Equipped with Bubbler as well as aerating valve. Transparent Bubbler provides a constant visual check on aeration. Used with compressed air source.

MODEL 1400 F

Equipped with Flowmeter and aerating valve. Actual rate of flow of air for purging can be preset and indicated on the Flowmeter. Requires compressed air supply.

MODEL 1400 M

For use where compressed air source is unavailable. Equipped with Manual Air Compressor and Aerating Valve.

Petrometer Gauges can be obtained in multiple units incorporated on a single panel and mounting plate to meet your specifications. High-level — low-level alarms also available.

For complete information, send for Bulletin 6004.

Petrometer CORPORATION

43-22 TENTH STREET, LONG ISLAND CITY 1, N.Y.

RECENT TRADE LITERATURE...

▸ *AIR CONDITIONERS* — Brochure lists features of "Roomaire" units. Shows available models, various installations. *Young Radiator Co., Dept. HPAC, 709 S. Marquette St., Racine, Wis.*

▸ *AIR CONDITIONING UNITS* — Bulletins No. C-1100-S106P, No. C-1100-S107P, No. C-1100-S108P give dimensions, operating data on both vertical, horizontal models of central station cabinet type air conditioning units. *Worthington Corp., Dept. HPAC, Harrison, N. J.*

▸ *AIR CONDITIONING, VENTILATION, REFRIGERATION, HEATING* — New 1956 estimating catalog contains information, wholesale prices on supplies and equipment carried by company. *M. Blazer & Son, Dept. HPAC, 173 Market St., Passaic, N. J.*

▸ *AIR HOSE FITTINGS* — New 8 page Bulletin No. 110 describes, illustrates "Le-Hi" air hose fittings for mining, tunneling, contracting, quarrying, construction and in industry wherever compressed air is utilized. *Hose Accessories Co., Dept. HPAC, 2700 No. 17th St., Philadelphia 32.*

▸ *BLOWER COILS* — New 32 page commercial refrigeration coil catalog No. 56 stresses new line of blower coils known as "Power Pack," "Half Dome," "Twin Power Pack." Suitable for use on drip pumps. *Peerless of America, Inc., Dept. HPAC, 5830 N. Pulaski Rd., Chicago 30.*

▸ *BOILERS* — Catalog AP-294 lists net steam rating of boilers at 240 Btu as ranging from 6440 to 50,000 sq ft; net water rating at 150 Btu is 10,300 to 80,000 sq ft. Drawing shows component parts of boiler. Ratings, capacities, recommended burner sizes, dimensions, engineering data included. *Pacific Steel Boiler*

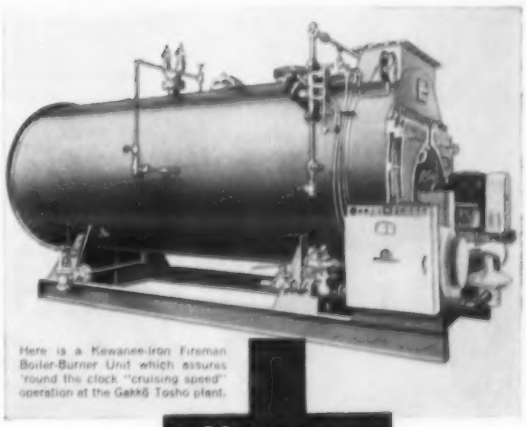
徐行

EAST MAY BE EAST . . . WEST MAY BE WEST . . .

but *"Cruising Speed"* boiler operation is best . . . *anywhere*

Gakkō Tosho Printing Company, Hara-machi Plant, Tokyo, Japan
Architect: Mr. H. Kishida and Mr. K. Tange, Tokyo, Japan
Engineer: Mr. K. Kawai, Toyohashi, Japan
Heating Contractor: Matsuhisa Industrial Company, Numazu, Japan

In Far Away Tokyo, Kewanee Boilers Were Selected by Gakkō Tosho Company Because They Provide Reserve Power to Meet Fluctuating Needs. No matter how you say it, in English or Japanese, "cruising speed" boiler operation adds up to the same thing in any language . . . higher efficiency, lower fuel cost, lower maintenance, less wear and tear, longer boiler life. And that's what management at Gakkō Tosho Company wanted in their modern Tokyo printing plant. So they selected Kewanee Reserve Plus Rated Boilers. Here they were assured reserve power to automatically supply steam quickly to operate automatic printing equipment. Reserve power in boilers means "cruising speed" operation . . . dependability . . . with enough power always on tap faster, surer. It means boilers rated on nominal capacity. Boilers rated on maximum capacity run at constant top speed, pile up maintenance and fuel costs—cut boiler life. Next time, choose Kewanee Boilers. Just call for the Kewanee man—in English, Japanese or Sanskrit—and he'll come running to serve you. KEWANEE BOILER DIVISION of AMERICAN-STANDARD, 101 Franklin Street, Kewanee, Illinois



Here is a Kewanee-Iron Fireman Boiler-Burner Unit which assures 'round the clock "cruising speed" operation at the Gakkō Tosho plant.

KEWANEE
reserve plus rated

KEWANEE BOILERS

You can depend on Kewanee engineering

ANNOUNCING . . . New Remington Cartridge-Powered Tool for Stud Fastenings

REMINGTON *'MIGHTY MITE'*

STUD DRIVER sets a stud a minute in steel or concrete!

Here's the "MIGHTY MITE"—small but powerful partner of the full-size Remington Stud Driver—the answer to any job requiring a ¼" diameter stud. It's the perfect tool for builders, light contractors and the "do-it-yourself" market . . . can be rented or purchased. You can buy it for *only $34.75!*

The "MIGHTY MITE" has only three parts to handle . . . easy to load and operate. The upper assembly is unscrewed, the 22 caliber cartridge with the desired ¼" stud is inserted, and it's ready to go. One rap of the hammer on the firing pin, and "MIGHTY MITE" rigidly anchors wood sections or steel fixtures to concrete or steel! No pre-drilling required.

Safe, too. It's non-tilt—cannot be fired at an angle; cocks only when held in the proper firing position; must be pushed firmly into position to expose the firing pin. A four-inch-square guard provides full protection to the operator.

Send for the facts about the REMINGTON "MIGHTY MITE"—small, powerful and ideal for your construction job—at the lowest possible price—

ONLY $34.75

Another great NEW cartridge-powered industrial tool by

Remington

DU PONT

Industrial Sales Division, Dept. HPA-7
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the new Remington "Mighty Mite" Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

RECENT TRADE LITERATURE

Continued

Div., National-U. S. Radiator Corp., Dept. HPAC, Johnstown, Pa.

▸ *BOILERS* — Catalog AP-296 describes, illustrates eleven models of "700" series steel boilers for small commercial application. Literature reviews seven three-pass models, construction; design for automatic or hand firing with oil, gas, coal. *Pacific Steel Boiler Div., National-U. S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

▸ *BURNER CONTROLS* — Bulletin CF-21 contains operating data, dimensional drawings, specifications for primary control system for light oil, gas fired burners. Describes how "Firetron" scanner visually monitors both pilot, main flames on pilot-ignited burners. *Electronics Corp. of America, Combustion Control Div., Dept. HPAC,* 718 *Beacon St., Boston.*

▸ *CANNED MOTOR PUMPS* — Four page bulletin 1050 details features, specifications of pumps for general process pumping. Included are performance curves, dimensions, principles of construction and operation, cutaway views, materials available, power requirements. *Chempump Corp., Dept. HPAC,* 1300 *E. Mermaid Ln., Philadelphia* 18.

▸ *CENTRIFUGAL PUMPS* — Eight page bulletin No. A-156 describes, illustrates uses wherever liquids of low viscosity are to be moved. Cross-sectional drawings, construction details for standard sizes to 10 in. discharge included. *C. H. Wheeler Mfg. Co., Dept. HPAC,* 19*th and Lehigh, Philadelphia* 32.

▸ *CLAY FLUE LINING* — Six page illustrated brochure describes advantages of clay flue lining in chimney construction. Features standard recommendations for safe chimney construction, complete with drawings, ASTM specifications. *Clay Flue Lining Institute, Dept. HPAC,* 161 *Ash St., Akron* 8.

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REMOTE TYPE FOR HEATING • COOLING • VENTILATING

OFFERS THE BEST FEATURES AVAILABLE IN THE INDUSTRY

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The new Airtherm Unit uses a central source of hot water for heating, chilled water for cooling and combines the best features the industry has developed through the years.

This "Feature Research" guarantees you the greatest possible versatility of installation, efficiency of operation and dependability.

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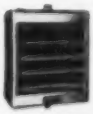

Propeller Fan Unit Heater

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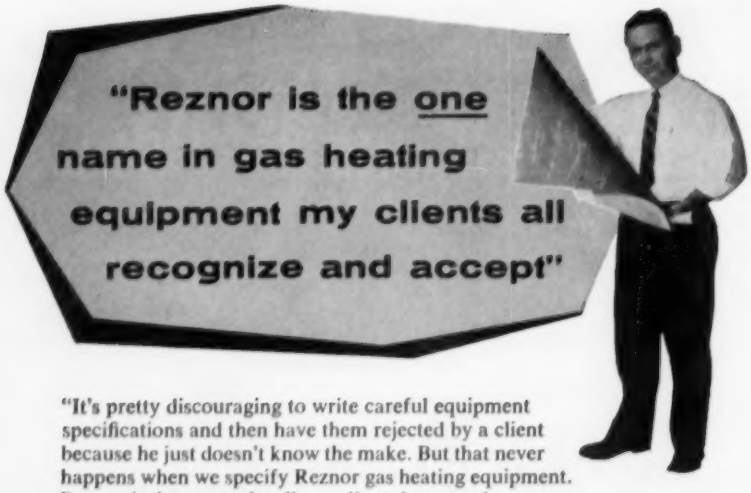


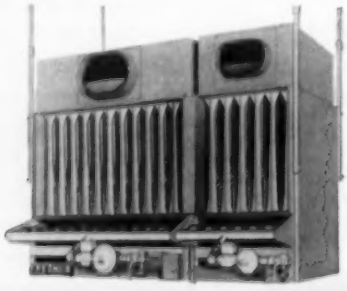
"It's pretty discouraging to write careful equipment specifications and then have them rejected by a client because he just doesn't know the make. But that never happens when we specify Reznor gas heating equipment. Reznor is the one make all our clients know and accept. It's not hard to understand why. Reznor sells nearly one out of two gas unit heaters, so Reznor is the unit heater our customers are used to seeing wherever they go. And Reznor is the brand they see advertised in the national magazines they read.

"Client acceptance is only one of the reasons we specify Reznor equipment. We know from experience that Reznor stands for quality of construction and performance. High operating efficiency . . . long life . . . dependable service.

"We like to work with Reznor because it gives us one source for all our gas heating equipment needs . . . suspended gas unit heaters for all industrial and commercial heating requirements . . . gas-fired duct furnaces which let us custom engineer heating and heating-cooling systems to meet exact job requirements.

"We appreciate Reznor availability, too. There's a stocking Reznor distributor in every major city. We know we can specify Reznor equipment with complete assurance that the units we specify will be available when and where they're needed."

Yes, Reznor is the preferred line of gas heating equipment . . . preferred by clients, by architects, engineers and heating contractors. If you don't know Reznor, it's time you got acquainted. Write today for free catalog or give your nearby Reznor distributor a call. You'll find him listed under "Heaters-Unit" in the yellow pages of your telephone directory.



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THE WORLD'S LARGEST-SELLING GAS UNIT HEATERS
REZNOR MANUFACTURING COMPANY
51 Union Street, Mercer, Pa.

RECENT TRADE LITERATURE

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▸ *COMPRESSORS* — Booklet covering new parts, service instruction has been released for the four-cylinder high-speed belt-driven compressors. Illustrated service instructions cover replacement of valve plates, seal assembly, oil pump. *Copeland Refrigeration Corp., Dept. HPAC, Sidney, O.*

▸ *COOLERS* — Literature describes applications, specifications, illustrates new remote-type coolers. *Temprite Products Corp., Dept. HPAC, Box 72, E. Maple Rd., Birmingham, Mich.*

▸ *DEHUMIDIFICATION* — New 6 page bulletin No. 496 includes details about what humidity is, what it does, gives answers to 10 most asked dehumidification questions. Shows latest equipment to dehumidify areas. *Abbeon Supply Co., Dept. HPAC,* 179-15 *Jamaica Ave., Jamaica, N. Y.*

▸ *DEMINERALIZING* — Technical reprint T-140 discusses advantages, disadvantages of this process for today's power plants. Article has tables on characteristics of anion exchangers, materials of construction, glossary of terms, specific conductivity of effluent, flow sheets, descriptive drawings, performance curves, process selection charts, cutaway views. *Graver Water Conditioning Co., Dept. HPAC,* 216 *W. 14th St., New York* 11.

▸ *ELECTRIC BRAKES, CLUTCHES* — Form WEB 6212 describes line, specifications for primary electric brakes, clutches, clutch-brakes; fractional horsepower "RF" electric brakes, "SF" electric clutches; clutch-couplings; integral horsepower electric brakes, clutches. Also included is information on controls available. *Warner Electric Brake & Clutch Co., Dept. HPAC, Beloit, Wisc.*

▸ *ELECTRIC HEATING CABLE* — "Chromalox Thermwire" described

Much like the movement *of a fine waterproof watch...*

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HERMETICALLY sealed inside your compressor, A. O. Smith motors are quality-built to provide a reliable source of power for refrigeration or air conditioning, year-in and year-out. They're custom-built and dynamically-balanced for years of dependable, quiet, vibrationless service. What's more, each motor is manufactured under strict quality control . . . assembled and tested under controlled atmospheric conditions, ever-free of dirt and dust.

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ELECTRIC MOTOR DIVISION

TIPP CITY, OHIO

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Each hermetic motor is carefully packaged in a heavy fibre-board box . . . all are carefully wrapped in a plastic blanket. Further protection from moisture is obtained by insertion of individual bags of silica jel.

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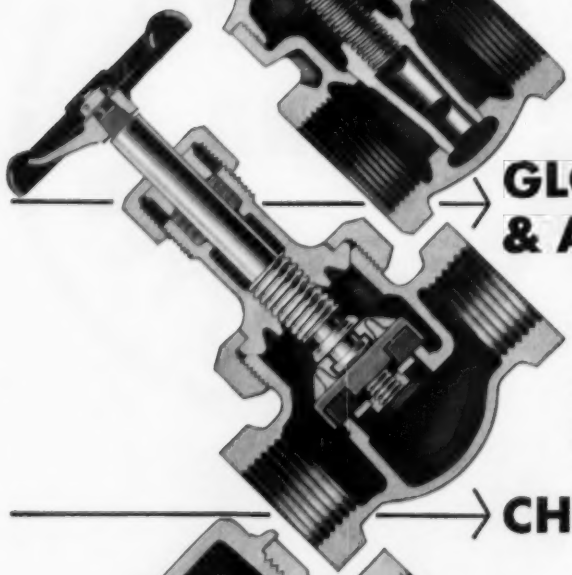
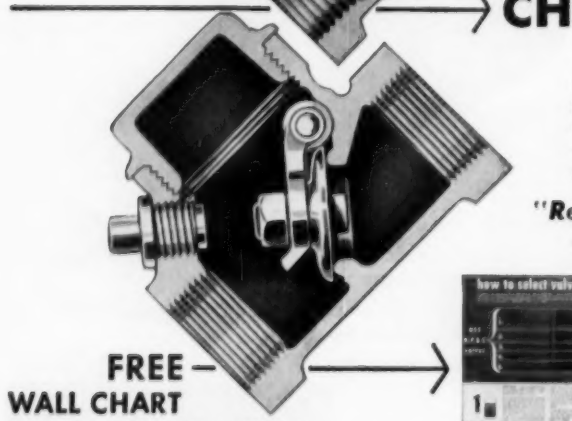
GATES

Fig. 86 illustrated, rated for 125 lbs., steam, 200 OWG, has stationary stem, solid wedge, screwed ends. Other 125 lb. models with screwed bonnet, rising stem, solid or split wedge.



GLOBES & ANGLES

Fig. 1A Globe illustrated, rated 150 lbs. steam, 300 OWG, has renewable asbestos disc, union bonnet. Also furnished as Angle. Sizes ¼" to 3".



CHECKS

Fig. 198 illustrated, rated for 125 lbs. steam, 200 OWG. Other swing check valves in 150, 200, 300 lb. classes.

"Reliable Protection & Control"

FREE—
WALL CHART
"HOW TO SELECT VALVES"
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Better Values

RECENT TRADE LITERATURE

Continued

in 4 page folder. Literature includes prices, standard ratings, installation data, applications, characteristics, etc. *Edwin L. Wiegand Co., Dept. HPAC, 7500 Thomas Blvd., Pittsburgh 8.*

▸ *ELECTRIC TOOLS* — Line of electric tools for use in industrial, construction, maintenance fields described, illustrated in 44 page catalog 39-C. Specifications, information given on newly introduced items. *Thor Power Tool Co., Dept. HPAC, Aurora, Ill.*

▸ *ELECTRONIC TEMPERATURE CONTROLLER* — Specification sheet S1010-1 describes model 077, a non-indicating device operated on balanced bridge principle. Contains specifications, uses, output load ratings, ranges and scales. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▸ *EXHAUST HOODS* — Twelve page bulletin 270-E3 describes different designs of exhaust hoods for dust control in woodworking industry. Covers localized applications, explains exhaust ventilation in connection with sanders, saws, wood borers, exhaust volume, transport velocity, etc. *American Air Filter Co., Inc., Dept. HPAC, 215 Central Ave., Louisville 8.*

▸ *FAN-COIL UNITS* — Bulletin covers applications, dimensions, capacities, performance and installation of fan-coil units for summer-winter air conditioning. *National-U. S. Radiator Corp., Dept. HPAC, 221 Central Ave., Johnstown, Pa.*

▸ *FILTER* — Four page illustrated bulletin No. 1505-3 includes data on construction, installation, testing, performance of "Ultra Aire" space filter with new filter media of non-combustible glass fiber web. *Mine Safety Appliances Co., Dept. HPAC, 201 No. Braddock Ave., Pittsburgh.*

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Now sheet metal users can look to a new, dependable source of galvanized sheets. Jones & Laughlin Steel Corporation is putting more than 100 years of steel-making experience behind its new facilities for the production of high grade galvanized sheets.

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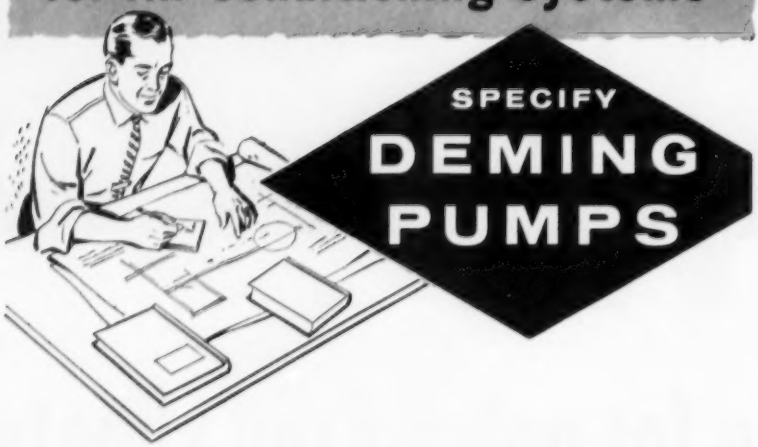
EXPEDITE PUMP SELECTION
for Air Conditioning Systems



These standard Deming Centrifugal Pumps have characteristics which contribute to efficient, economical air conditioning service. The three types of units illustrated cover a range of capacities from 5 through 1,000 G. P. M.

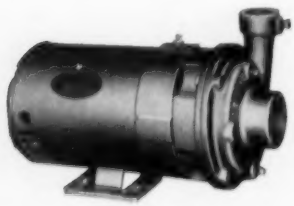


Fig. 4351 Series

Deming "MOTOR-MOUNT" Centrifugal Pumps, Figs. 4351 and 4357 are compact, dependable units. Available with ⅓ through 5 H.P. motors. Capacities from 5 through 140 G.P.M.

Fig. 3350 Series

Self-Priming type of "MOTOR-MOUNT" Centrifugal Pump. Priming is rapid, automatic, and foolproof. Non-siphoning feature. Capacities range to 140 G.P.M.

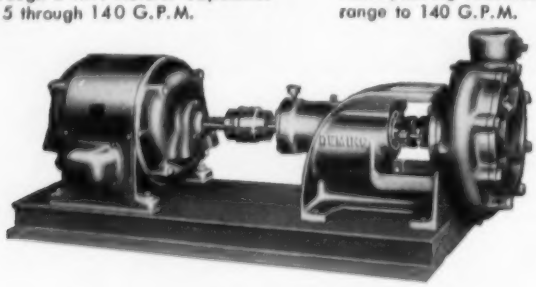


Fig. 4011 Series

These end suction centrifugal pumps are ideally suited for air conditioning service. 4-piece liquid end assembly permits easy service and maintenance. Two ball bearings supporting the shaft are mounted on heavy duty, streamlined support head. Many other top quality features. Capacities range to 1,000 G.P.M.

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THE DEMING COMPANY
560 Broadway, Salem, Ohio

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▸ *FILTERS* — Filter bulletin and technical article on gas filtration contain information, facts about "Staynew" natural gas, dust eliminating filters. *Dollinger Corp. Dept. HPAC, Centre Park, Rochester 3, N. Y.*

▸ *FLOWMETER* — No. 10-A-25, a 16 page catalog, describes new glass tube variable-area "Flowrater" meters. Data includes section devoted to extensions, secondary instruments which can be used with "1700" series meters. *Fischer & Porter Co., Dept. HPAC, 692 Jacksonville Rd., Hatboro, Pa.*

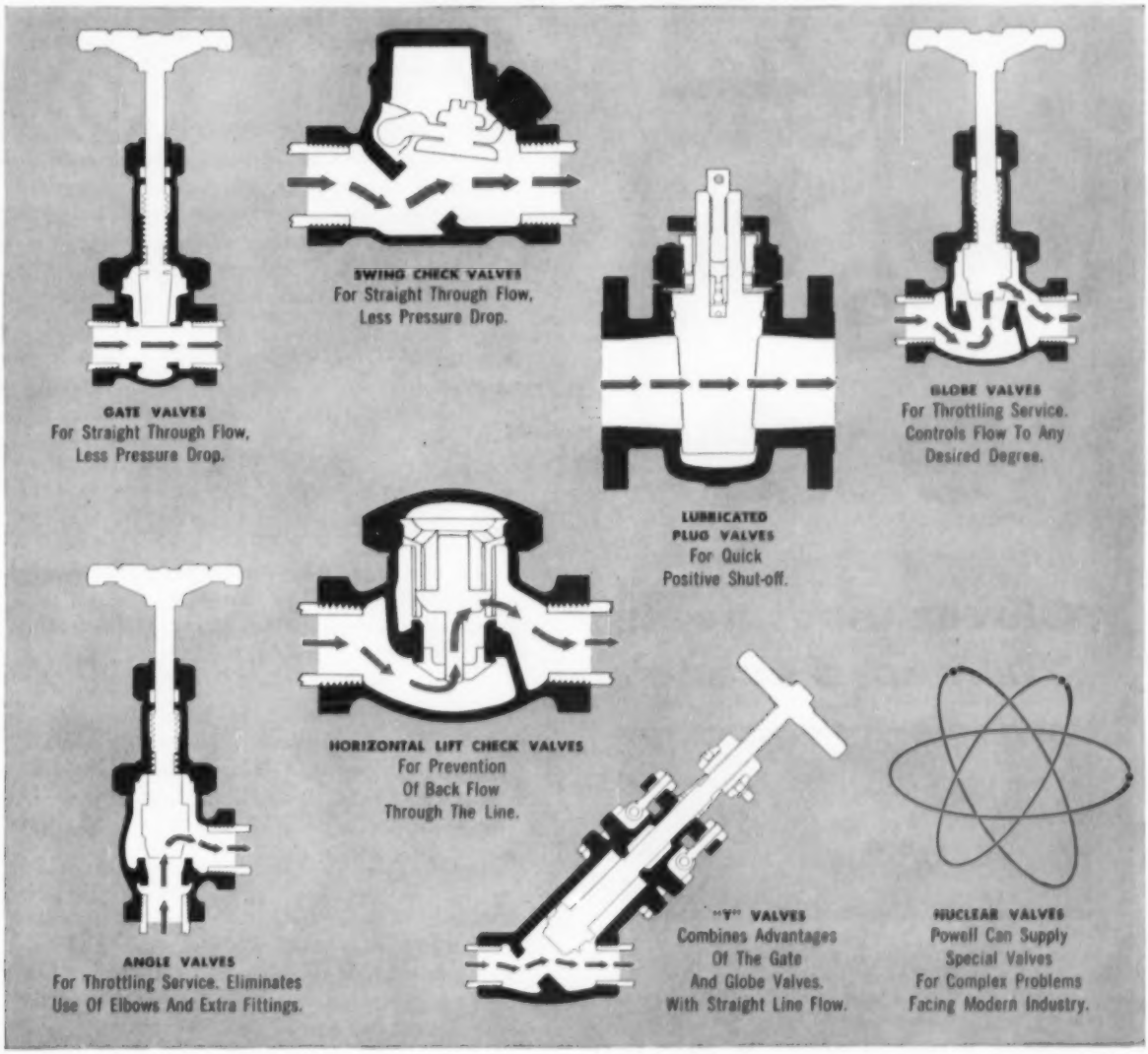
▸ *FLUORINATED HYDROCARBON REFRIGERANTS* — Technical wall chart gives physical, vapor pressure data for "Genetron." Provided are such data as freezing point, boiling point, liquid and vapor densities, solubilities. *Allied Chemical & Dye Corp., General Chemical Div., Dept. HPAC, 40 Rector St., New York 6.*

▸ *FRACTIONAL HP ELECTRIC MOTORS* — New 12 page catalog contains information on complete line of company's "MicroMotors." Included are photographs, diagrams, performance data. *Redmond Co., Inc., Dept. HPAC, Owosso, Mich.*

▸ *GAS CONTROL* — Bulletins G-170, G170A describe design, construction of new gas control. Mechanical specifications, dimensions, design details, capacities, and four thermostatic accessories used on "Fifty-Five" illustrated, described. G170 keyed to interest of design, production engineers; G170A, to sales managers, distributors, dealers. *A-P Controls Div., Controls Corp. of America, Dept. HPAC, 2400 North 32nd St., Milwaukee 45.*

▸ *GLASS PIPE, FITTINGS* — Catalog 80-10 describes company's line of glass pipe, fittings, made from "Pyrex Brand" glass tubing; new thread-

POWELL
for all valve needs



for every flow control problem there is a right Valve

Powell can supply this right valve–*made right* of the right material*. Every part of every valve must pass rigid inspection. And as a final step in manufacture, every Powell Valve has *Performance Verified* through an *actual line test.*

As an aid in selecting the right valve, the basic valve designs are illustrated here. For complete information on the wide range of sizes and materials available in each type of the basic valves illustrated above, consult your Powell Valve distributor. If none is located near you–or if you have a special flow control problem–write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

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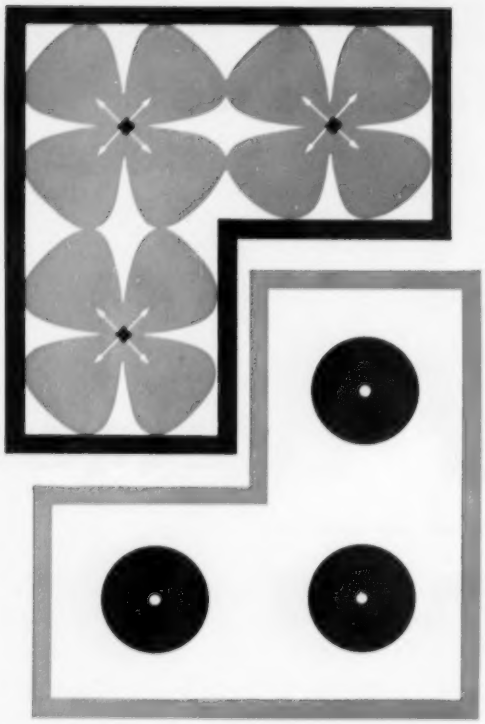
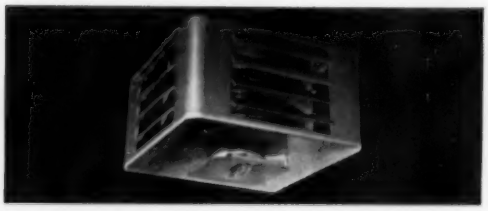


"Clover leaf" heats 70% more space



Three of Carrier's new 4-way Unit Heaters with "clover leaf" air distribution cover over 80% of this 100-foot-wide building. Three projection-type heaters of equal capacity with circular air patterns cover 10% of area!

Carrier's exclusive "clover leaf" air pattern discharges heat in four directions over areas up to 108 feet in diameter. Simple adjustments vary air pattern. No outlets to change. No accessories to add. Extra coverage means fewer units, installation and operating savings.

Carrier 4-way Unit Heaters, for use with steam or hot water, come in 8 sizes: 55,000 to 600,000 Btu/hr. Look in your Classified Telephone Directory for the name of your Carrier jobber-distributor.

Complete Line of Unit Heaters. With over 50 years' leadership in temperature control, Carrier knows heating. Carrier Corporation, Syracuse, New York.

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RECENT TRADE LITERATURE *Continued*

ed metal couplings for metal-to-glass, glass-to-glass connections; high pressure glass stopcocks which are offered in spigot type, two-way, three-way designs. *Fischer & Porter Co., Dept. HPAC,* 683 *Jacksonville Rd., Hatboro, Pa.*

▸ *HEATING, COOLING EQUIPMENT* — New 142 page catalog shows line of heating, cooling equipment and duct, pipe and fittings. Contains descriptions, specifications, dimensions; comprehensive listing with illustrations, list prices; engineering data accompanied by numbered charts. *Williamson Co., Dept. HPAC,* 3500 *Madison Rd., Cincinnati* 9.

▸ *HOT GAS DEFROST SYSTEM* — Sixteen page manual covers operation, application, specifications of "L Thermobank." Has engineering data for temperature applications 32 F to — 75 F, with ratings at various levels. *Kramer Trenton Co., Dept. HPAC, Trenton* 5, *N. J.*

▸ *HYDROMATIC VALVE* — Publication 5813 describes uses in control of demineralizers, zeolite softeners, dealkalizers, pressure filters. Lists design features, operation, advantages. *Cochrane Corp., Dept. HPAC,* 3131 *N.* 17*th St., Philadelphia* 32.

▸ *JALOUSIES* — Details on usage of exterior sun control jalousies to reduce air conditioning peak loads, provide light control, protect windows contained in new 4 page folder. Photographs show vertical, horizontal installations. *Lemlar Mfg. Co., Dept. HPAC, Box* 352, *Gardena, Calif.*

▸ *MACHINES, TOOLS* — Catalog for 1956 shows latest additions to company's line, prices now in effect. Includes full specifications of machines; details concerning punches, dies; descriptions of hand tools, special tools. Companion publication contains prices of punches, dies available. *Whitney Metal Tool Co., Dept. HPAC,* 110 *Forbes St., Rockford, Ill.*

▸ *METAL CORROSION* — Insulation manual includes information on metal corrosion, galvanic action plus details on newly developed series of corrosion resistant metals. Corrosion charts, technical data, complete line of equipment and supplies produced fully illustrated. *A. J. Gerrard & Co., Dept. HPAC,* 1950 *Hawthorne Ave., Melrose Park, Ill.*

▸ *METALWORKING MACHINES* — New 44 page catalog describes variety of forming, cutting, punching, notching operations in medium, light weight materials. Catalog features machine specifications, material forming capacities in tabular form. Includes pho-

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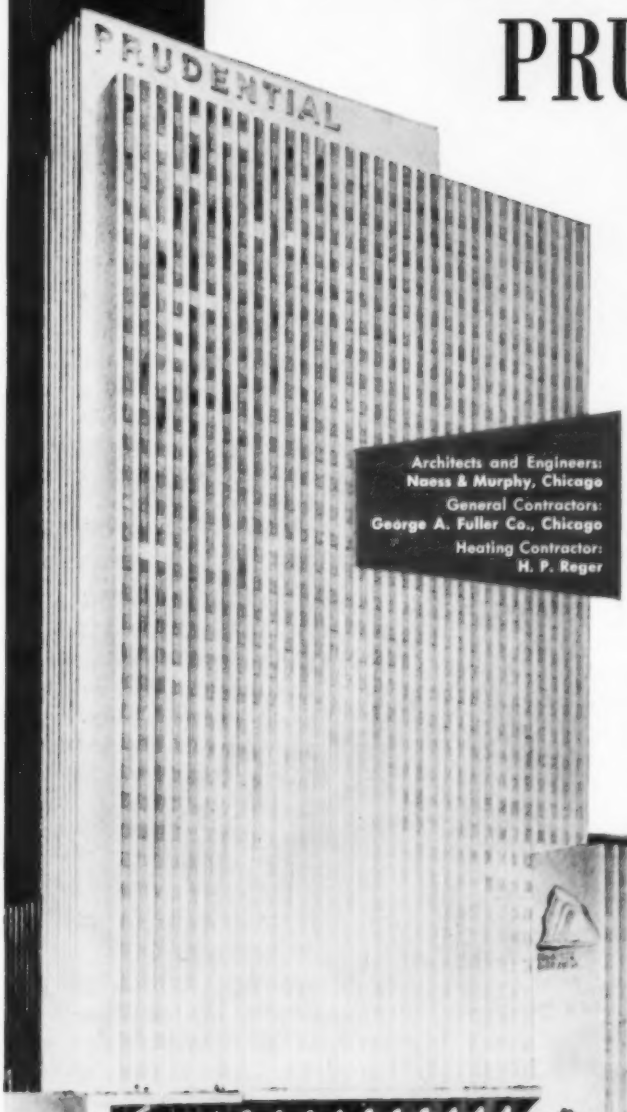

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"How can you improve as good a product as the "D" Type boiler?" It's a natural question when you consider that here is a boiler with sound, basic design, strong, careful construction and with a reputation for the highest standards of performance throughout the big building field. But a leader never stands still and Fitzgibbons engineers are constantly striving for additional improvements that better suit today's trends of installation. Hence, the following new features, sure to please engineers and contractors:

- Improved front smokebox access doors provide greater clearance for automatic firing equipment. Complete smokebox design assures a gas-tight fit.
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- Lifting eyes in the front and rear heads for easier rigging on the job.
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See your Fitzgibbons representative or write: FITZGIBBONS BOILER COMPANY, INC. 101 PARK AVENUE, NEW YORK 17, N. Y. for full details.

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The Fitzgibbons Boiler

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tographic case histories of how companies are applying "Die-Less Duplicating" techniques to their particular problems. *O'Neil-Irwin Mfg. Co., Dept. HPAC, 541 Eighth Ave., Lake City, Minn.*

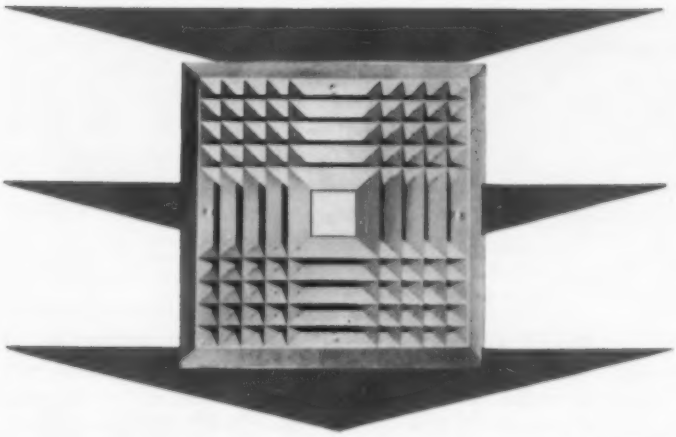
▸ *MOTORS* — New technical data sheet with dimensions and reference drawings for company's motors in new NEMA standard sizes now available. *ACEC Electric Corp., Dept. HPAC, 40 E. 49th St., New York 17.*

▸ *NAME PLATES* — Catalog sheet describes four accessories used to apply color anodized, etched aluminum foil name plates to crinkle, uneven, curved surfaces. Each item illustrated, described, prices listed. *North Shore Nameplate Inc., Dept. HPAC, 214 Northern Blvd., Bayside, L. I., N. Y.*

▸ *PIPE* — Technical folder TB-410 deals with the use of seamless, welded stainless steel pipe and stainless steel welding fittings in process industry where corrosion, elevated temperatures are determining factors. Eight page folder contains application data, hints on bending, joining, welding of products. *Babcock & Wilcox Co., Dept. HPAC, 161 E. 42nd St., New York.*

▸ *PLASTIC PIPE* — Latest issue of *Plastics Weldor and Fabricator* features use of polyethylene pipe designed for industrial waste, sewage lines with accompanying ease of installation, overall economy. *American Agile Corp., Dept. HPAC, Box 168, Bedford, O.*

▸ *PLATE COILS* — New 52 page bulletin 355 covers operating pressures, industrial heating, heat transfer coefficient, capacity table method, heating problems, determination of "Delta T," wall and surface losses, material load, spray and makeup loads, pressure drop, number of em-



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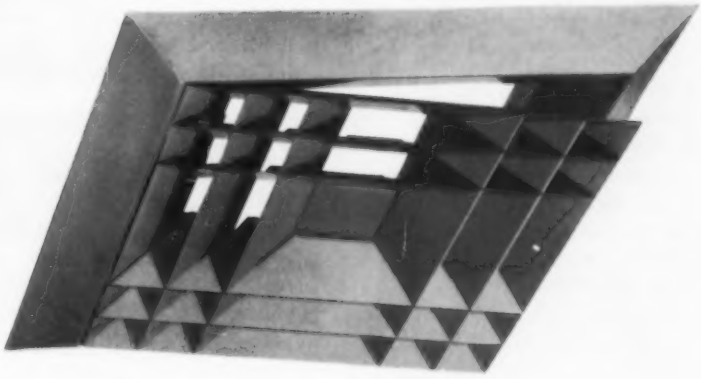
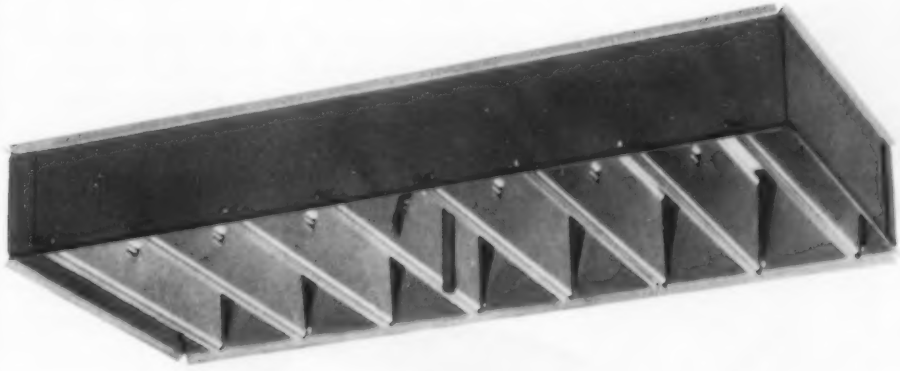


Type SX

Removable Core

Available in all face patterns and in unlimited sizes. Type SX, as shown, has standard frame, also made with flat frame or tile replacement frame.



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Volume Control

The TOB volume control has true opposed blades. Blades are pivoted at edge and orifices remain constant. No contrasting velocities. Fine adjustment with fast action.

AIR DISTRIBUTION PRODUCTS

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RECENT TRADE LITERATURE

Continued

bossings, weight, charges, conversion tables, etc., for company's plate coils. *Thermo-Panel Div., Dean Products Inc., Dept. HPAC, 616 Franklin Ave., Brooklyn 38.*

▸ *POWER ROOF EXHAUSTERS* — Booklet contains information on inconspicuous appearance, low installed silhouette, corrosion resistant finish, structural design, quiet operation, ratings, etc., of company's power roof exhausters. *Gallaher Co., Dept. HPAC, 4108 Dodge St., Omaha.*

▸ *PUMP PACKAGING PLAN* — Bulletin No. B-2319, titled "New Redi-Pak End-Suction Pumps," describes multiple benefits of packaging plan. Twenty-two job-sized pumps are prepackaged, designed for easy stacking, storage, ordering, application. *Peerless Pump Div., Food Machinery and Chemical Corp., Dept. HPAC, 301 W. Ave. 26, Los Angeles.*

▸ *PUMPS* — New 12 page data sheet using photographs, schematics, line drawings, illustrates design, construction, operation of abrasion resistant centrifugal pumps for hydraulic ash handling systems. Tables give capacities, related data including friction loss in pipe, fittings. *Allen-Sherman-Hoff Co. Dept. HPAC, 259 E. Lancaster Ave., Wynnewood, Pa.*

▸ *PVC PIPE, VALVES, FITTINGS* — Eight page "Engineering Memorandum" covers in detail corrosion resistance, general properties, fabricating characteristics, economies. *Peter A. Frasse & Co., Inc., Dept. HPAC, 17 Grand St., New York 13.*

▸ *RELAY* — Bulletin gives description, technical data, illustrations of new midget "Minirelay" mercury plunger relay. Covers operational, construction details, load ratings, typical features. *Ebert Electronics Corp., Dept. HPAC, 212-31R Jamaica Ave., Queens Village 28, N. Y.*

▸ *RESISTANCE WELDING* — Bulletin 331, a 12 page "Designer's Guide for Electric Resistance Welding," has as general objects the overall design consideration and specific design instruction. Specific fastening methods covered in detail. *Sciaky Bros., Inc., Dept. HPAC, 4915 W. 67th St., Chicago.*

▸ *RUST, SCALE PREVENTATIVE* — Booklet covers applications of "Briquettes" for keeping scale, corrosion out of steam boilers, evaporative condensers, air conditioning units. *American Sand-Banum Co., Inc., Dept. HPAC, Freeport, N. Y.*

▸ *SEPTIC TANKS, CESSPOOLS* — Illustrated 8 page booklet entitled "The Story of Willie Bacteria, or How To Take Care of Your Septic Tank or Cesspool" describes the bacterial action of the disposal system and what is necessary for its proper function. *Educational Div., FX-Lab Co., Dept. HPAC, 4 Hill St., Newark.*

REED

● This new Reed Tube Cutter—a faster, lighter-weight roller cutter—is the first cutter for 1" to 3" copper tubing; equally ideal for brass and aluminum tubing from 1" to 3".

New TC3 TUBE CUTTER!

APPROX. 2/3 ACTUAL SIZE

PATENT PENDING

SO light that it weighs just a fraction as much as conventional pipe cutters in the same size range, this new Reed TC3 Tube Cutter does a faster, more convenient cutting job on 1" to 3" tube of copper, brass or aluminum.

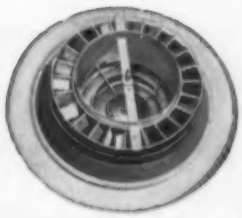
THE new Reed TC3, with its single cutting wheel in the movable arm, is far quicker and easier than a hacksaw; the ultra-thin alloy cutting wheel leaves almost no burr; and TC3's lighter pressure avoids distortion of tubing, thereby safeguarding tightness of solder or slip joints. With the single wheel in plain view for lining up with the cut-off mark, the cutter hooks quickly and easily on to tube for a right angle cut.

FRAME of this new Reed TC3 is as light as it is strong and durable because it has been specially-designed of high-grade ductile iron

REED MANUFACTURING COMPANY ERIE, PA., U.S.A.

TYPE R Circular, adjustable volume, constant pattern and radius of diffusion.

TYPE V Circular, adjustable volume and pattern, for heating and cooling.

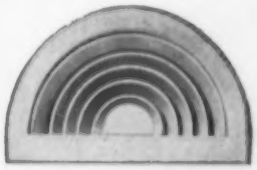


TYPE CH Circular, adjustable supply and return, for heating and cooling.

a model for every diffuser need FLEXIFLO

- CIRCULAR • SQUARE
- RECTANGULAR • ADJUSTABLE
- AUTOMATIC

All FLEXIFLO diffusers are styled simply, beautifully . . . finished in baked enamel of any desired color . . . extra features include built-in equalizing deflectors . . . simple, easy installation and removal of diffuser cores with just a "twist of the wrist."

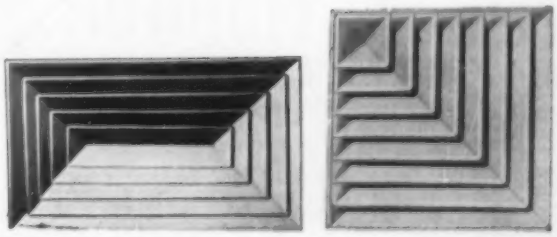


TYPE S Half-round, for side wall or ceiling, for heating or cooling.

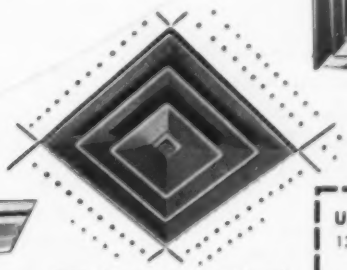
TYPE A Circular, adjustable volume, constant pattern *AUTOMATICALLY CONTROLLED.*

A COMPLETE LINE OF DIFFUSER ACCESSORIES

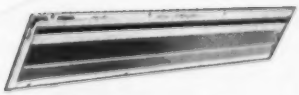
Let a trained FLEXIFLO sales engineer help you solve your air distribution problem. Representatives in major cities throughout the U.S. and Canada.



TYPE MP Rectangular, for one, two, three or four-way diffusion, 16 styles, hundreds of sizes to accommodate any shaped area.



TYPE H Square, adjustable volume, constant pattern and radius of diffusion.



TYPE MPL Long strips of any length, for one- or two-way diffusion.

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1360 GARRISON AVE., NEW YORK 59, N.Y.

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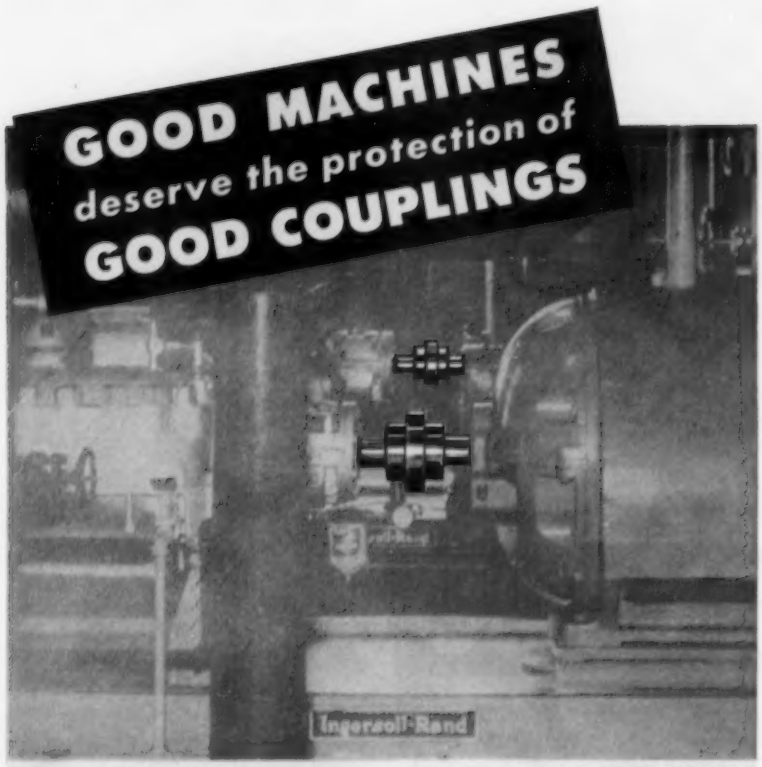

...and they get it with

Waldron
COUPLINGS

The motor driven boiler feed pump application pictured above needs a WALDRON coupling to make it a top engineering and mechanically perfect installation. That's why WALDRON is being specified by more and more pump and compressor manufacturers.

SHEAR PIN ... CUT-OUT ... FLOATING SHAFT ... SPACER ... OIL COLLECTOR
CONTINUOUS LUBRICATED ... PLUS OUR HS HIGH SPEED COUPLING

Complete details in Catalog 57

JOHN WALDRON CORP.
NEW BRUNSWICK • NEW JERSEY
Sales Representatives in Principal Cities
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RECENT TRADE LITERATURE
Continued

▸ *STEEL PIPE, TUBING* — TDC-163A, a six page folder, furnishes information on analysis, mechanical and physical properties, creep and rupture data, on many tubing alloys for elevated temperature service. *Babcock & Wilcox Co., Dept. HPAC, 161 E. 42nd St., New York.*

▸ *SUMP-TYPE GRINDER* — Eight page Data Sheet Ra describes company's double roll grinder designed for sizing materials in handling systems. Sheet covers design, construction features with drawings, legends. Line drawings give dimensions, installation data for installations below, above floor level. *Allen-Sherman-Hoff Co., Dept. HPAC, 259 E. Lancaster Ave., Wynnewood, Pa.*

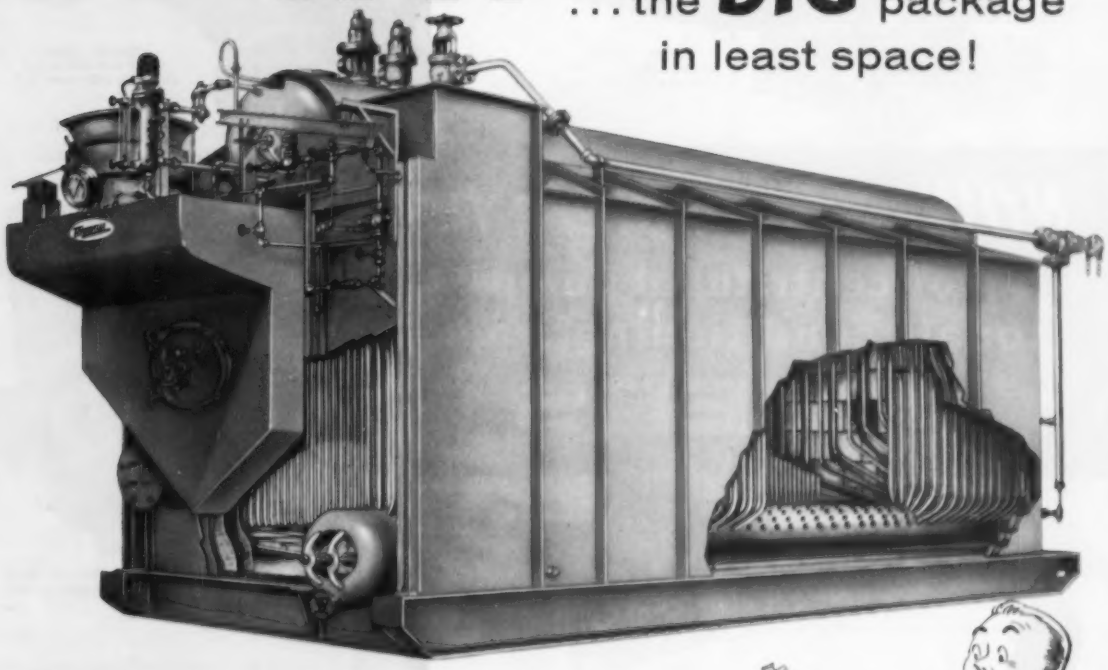
▸ *TEMPERATURE CONTROLS* — Recording, indicating, non-indicating controls (electrical, mechanical), thermometers, bulb installation accessories, how to order thermal elements, process timers, "Saf-T-Flame" gas pilots; for applications ranging from −30 to 1200 F detailed in 8 page illustrated catalog. *Partlow Corp., Dept. HPAC, 2 Campion Rd., New Hartford, N. Y.*

▸ *THERMOMETERS, HYDROMETERS* — Catalog 19-B contains laboratory, precision instruments, thermometers, hydrometers. Industrial midget, dial, v-case thermometers, psychrometers will be listed in Catalog 21, to be released soon. *H-B Instrument Co., Dept. HPAC, American and Bristol Streets, Philadelphia 40.*

▸ *TUBING, PIPE* — Technical data folder TDC-154A gives maximum allowable stress values for ferrous pipe, tubing, Includes values at various temperatures for complete range of seamless and welded carbon, alloy and stainless tubing steels plus formula used in connection with stress values in calculating maximum allowable working pressures. *Babcock & Wilcox Co., Dept. HPAC, 161 E. 42nd St., New York.*

Titusville WTP Steam Generator

...the BIG package in least space!



BIG IN CAPACITY (up to 40,000 lbs)

BIG IN PERFORMANCE

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Yet Titusville Type WTP Steam Generators offer gratifying space economies in the boiler room. Skilled engineering achieves utmost compactness in every WTP size—easy to transport, easy to install!

The shop-assembled Type WTP unit is a 2-drum, bent tube, water tube boiler—shipped complete with all components in place. It is adapted for firing with heavy oil; combination heavy oil and gas; light oil; combination light oil and gas; natural, coke oven or manufactured gas. Write for full details in new Bulletin 5511.

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BOILER DIVISION—BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

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A Division of Struthers Wells *Corporation*

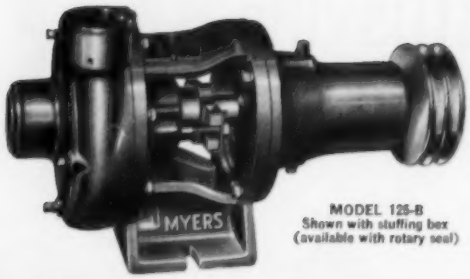
TITUSVILLE, PENNSYLVANIA

Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

Plants at Titusville, Pa. and Warren, Pa.

Offices in Principal Cities

MODEL 125-M
Shown with stuffing box
(available with rotary seal)



MODEL 125-B
Shown with stuffing box
(available with rotary seal)

NOW...a complete line
of centrifugal pumps for air conditioning from...
MYERS

MODEL 100-B
Rotary seal only

MODEL 100-M
Rotary seal only

FULL RANGE OF SIZES
⅓, ½, ¾, 1, 2, and 3 horsepower, motor-mounted or belt-driven models.

TWO CASING SIZES
1″ x 1¼″ or 1¼ x 1½″.

ALL-BRONZE IMPELLER
Accurately balanced for smooth operation.

REMOVABLE BRONZE WEARING RINGS
Easily replaced for longer pump life.

ROTARY SEAL
Eliminates leakage (stuffing box may be specified on "125" models.)

CORROSION-RESISTANT SHAFT
Stainless steel for trouble-free service.

WIDE RANGE OF CAPACITIES AND HEADS
Capacities to 90 GPM. Heads up to 135 feet.

Write today *for Bulletin 210 on* Myers *Centri-Thrift Pumps.*

Myers

PUMPS WATER SYSTEMS AND WATER SOFTENERS

The F. E. Myers & Bro. Co., Ashland, Ohio

RECENT TRADE LITERATURE

Continued

▸ *VALVES* — New 32 page catalog No. 256 details steel valves for variety of marine applications. Listed, illustrated are features of units in complete line. *Edward Valves, Inc., Dept. HPAC,* 1201 *W.* 145*th St., East Chicago, Ind.*

▸ *VALVES* — New 20 page catalog V-55 illustrates, lists specifications for magnetic and motorized valves for use with air, water, gas, steam, oil, refrigerants. *Mercoid Corp., Dept. HPAC,* 4201 *Belmont Ave., Chicago* 41.

▸ *VALVES* — Six page bulletin describes "Safety Cleanout Valve" for use on buried tank installations for storage of volatile, inflammable liquids. Construction, operation features given in detail. *Petrometer Corp., Dept. HPAC,* 43-22 10*th St., Long Island City* 1, *N. Y.*

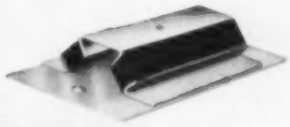
▸ *V-BELTS* — Bulletin No. V-1400-B20-P contains illustrations of types of v-belts available for drives employed in heavy industrial applications, miscellaneous light machinery drives plus complete listing of sizes available. Featured are steel cable belts with high hp rating. *Worthington Corp., Dept. HPAC, Oil City, Pa.*

▸ *VIBRATION CONTROL* — Bulletin gives details on methods for preventing transmission of vibration from heating, ventilating, air conditioning, refrigeration equipment. Included are recommendations for isolating self-contained air conditioning units, cooling towers, boilers, induced or forced draft fans, piping, etc. *Vibration Mountings, Inc., Dept. HPAC,* 98-25 50*th Ave., Corona* 68, *N. Y.*

▸ *WATER HEATERS* — Circular describes two new gas fired water heaters for schools, dormitories, apartments, motels, restaurants, public buildings. Contains drawings,

HOW TO ISOLATE VIBRATION IN AIR CONDITIONING SYSTEMS

Here are eight practical solutions to your vibration problems

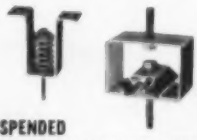


FOR ALL-PURPOSE USE

These rubber-in-shear vibration mountings are widely used for isolating vibration and noise on air conditioning equipment. Shipped complete, ready to use, their rated load is from 40 to 4000 lbs. Catalog RS-55.

FOR PUMPS COMPRESSORS, FAN-MOTOR SETS

Floating Rail vibration mountings have rubber-in-shear isolators. Rails are tapped and drilled to specification. Bases made for fan-motor sets are shipped complete, ready for installation. Catalog FR-55.

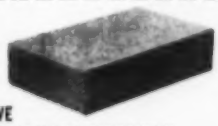


FOR SUSPENDED EQUIPMENT AND PIPING SYSTEMS

Two types of vibration hangers are available: rubber-in-shear (load range: 35 to 1500 lbs.), and steel spring (50 to 1400 lbs.). Both are extremely effective in preventing transmission of vibration from suspended equipment and piping systems. Catalog VH-55.

FOR WATER LINES

The original SOUNDZORBER. Wire-reinforced, wrapped-fabric, rubber pipe widely used for reduction of water line noise and vibration. Working pressures up to 250 psi. Sizes: ½ to 14" ID with I.P.T. male fittings or with full-faced rubber flanges backed up with Series 15 or 30 steel flanges. Catalog SZ-55.



FOR MASSIVE DIFFICULT-TO-ISOLATE EQUIPMENT

ISOLANT is an unusually strong and resilient material which provides excellent isolation of vibration, shock and noise. It is particularly suited for massive air conditioning equipment and similar machinery. Load range: up to 6000 lb. per sq. ft. Catalog IS-55.

FOR HEAVY EQUIPMENT

Steel Spring vibration mountings offer maximum vibration, shock and noise isolation of difficult-to-isolate low-speed machinery, heavy air conditioning equipment, and delicate instruments. Load range: from 100 to 6500 lbs. Catalog SS-55.

FOR FREON LINES

FLEXZORBER, a seamless flexible bronze tubing covered with woven wire braiding, is used to minimize vibration and noise in air conditioning and refrigeration freon lines. Standard copper tube female "slip fittings," welded on both ends, are available from ⅛" to 8" ID. Catalog FZ-55.

FOR STEAM AIR AND GAS LINES

EXPANDZORBER is a stainless steel, welded-diaphragm-type, packless expansion joint used for control of vibration, expansion and contraction in steam, chemical, oil and gas lines. Working pressure from vacuum to 1000 psi at −300 to +1800F. Sizes: ½" to 24" with steel flange or weld end fittings. Catalog EZ-55.

For complete catalog information, write—

FINN

T. R. Finn & Company, Inc., Industrial Division
200 Central Avenue, Hawthorne, New Jersey

VIBRATION FINNFLEX CONTROL

Industry's most complete line of shock and vibration controls

You Can Rely on GOODALL EXPANSION JOINTS

For Lower-Cost Installation and Longer Service Life

The problems of vibration, undesirable sound resulting from it, or expansion and contraction, are met with reliable efficiency and economy in GOODALL Rubber EXPANSION JOINTS . . . products of long experience and uncompromising craftsmanship.

WIDE SELECTION . . . Three Types — "Flang-Lok", Right Angle and Sleeve. Five styles — Single Arch, Multiple Arch, Tapered, Offset and Rectangular. All sizes — From ⅜" I. D. to 96" I. D. For pressure, vacuum or both.

EASIER TO INSTALL . . . on new construction or as replacements for other types. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. "Flang-Lok" Joints are especially easy to install, and provide a nonmetallic seal.

RESPONSIVE TO MINIMUM PRESSURE . . . Only slightest pressure is required to create movement in the rubber joint, in any direction. Result — stress on metal pipe or other member is reduced to absolute minimum.

HIGHER WORKING PRESSURES . . . Goodall Rubber Expansion Joints operate efficiently at working pressures to 125 lbs. P. S. I., depending on size.

LONGER SERVICE LIFE . . . No embrittlement . . . continuous movement (Flexing) actually keeps the rubber joint "alive." No corrosion. No electrolysis. Highest resistance to abrasion.

* * *

IF YOU HAVE A CORROSION PROBLEM, it is quite possible that Goodall "RUBBERHIDE" Linings will prove to be the right solution. Our engineers will be glad to make recommendations.

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GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

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RECENT TRADE LITERATURE

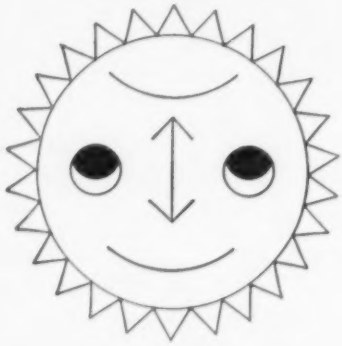
Continued

roughing-in dimensions, specifications for both models with capacities 500,000 and 700,000 Btu input per hr. *Bock Corp., Dept. HPAC,* 110 S. *Dickinson St., Madison* 3, *Wis.*

▸ *WELDERS* — "SPT 1" spot welder, "EPT 1" projection welder described in bulletin 335-1. Brochure includes dimensional drawings, illustrations. Machine data tabulated to indicate kva range, throat depths, welding capacities, electrode forces, etc. *Sciaky Bros., Inc., Dept. HPAC,* 4915 *W. 67th St., Chicago.*

▸ *WELDING — Picture Book of Facts on Eutectic's Welding Processes* contains 16 pages and gives information on company's "Low Heat Input" metal joining process. Tells how to use district engineer field service. *Eutectic Welding Alloys Corp., Dept. HPAC,* 40-40 172*nd St., Flushing* 58, *N.Y.*

The tragic fact, our doctors tell us, is that every third cancer death is a needless death... *twice* as many could be saved.



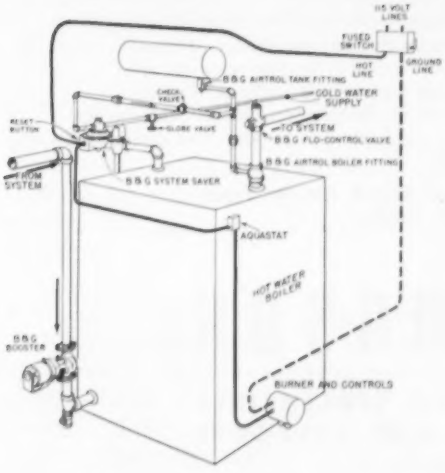
LET'S LOOK AT THE BRIGHTER SIDE

Many thousands of Americans are cured of cancer every year. More and more people are going to their doctors *in time*...To learn how to head off cancer, call the American Cancer Society or write to "Cancer" in care of your local Post Office.

American Cancer Society

NEW! FULL PROTECTION FOR HOT WATER BOILERS

PRESSURE REDUCING VALVE
. . . maintains water pressure in the system at all times, minimizing troubles caused by air in the system.
ASME PRESSURE RELIEF VALVE
. . . has many features in excess of ASME Code requirements. Resilient Silicone valve face assures tight seal.
EMERGENCY WATER FEED DEVICE
. . . opens pressure reducing valve wide to keep boiler full of water if the burner fails to shut off below 260°F.
EMERGENCY SAFETY SWITCH
. . . breaks electrical circuit if other controls fail. Switch must be reset before operation can resume.
BOILER
B&G 4 IN 1 SYSTEM SAVER



B&G System Saver and Airtrol System installed on top outlet boiler

Another B&G engineering achievement . . . *four utility and safety devices in one unit* . . . offering complete safety control for hot water heating systems!

1. Automatically fills the system. The *Pressure Reducing Valve* of the B&G System Saver maintains sufficient pressure to hold water in top floor radiation.

2. Automatically prevents excessive boiler pressures. The *A.S.M.E. Pressure Relief Valve* positively discharges water or steam at pressures over 30 psi.

3. Automatically shuts off burner. If regular controls fail, a *Safety High Limit Switch* breaks the electric power connection when boiler temperature reaches 245°-260°F. The switch must be manually reset.

4. Automatically adds cooling water under emergency conditions. In an overfired boiler, the relief valve will discharge until the boiler loses enough water to become seriously damaged. An ordinary pressure reducing valve cannot relieve this condition because it operates only when boiler pressure is below the valve setting.

When water is discharged from the System Saver Relief Valve at 245°-260°F, it flashes into steam, creating a back pressure which actuates the *Emergency Water Feed Device*, causing the Pressure Reducing Valve to open wide. Cold water at city pressure (it must be greater than heating system pressure—and not less than 35 lbs. to secure full capacity of the System Saver) then enters the boiler, even though system pressure has reached 30 psi.

BELL & GOSSETT
COMPANY
Dept. EK-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, W. Toronto

Every Day!...Everywhere!..

more and more pipe suspension jobs are being serviced and delivered by Fee & Mason stocking wholesalers

Fee & Mason's vast national distribution system of local stocking wholesalers puts all the advantages of doing business with "America's Leading Specialists in Pipe Hangers and Supports" right in your own back yard!

Aside from prompt local delivery from F&M stocking wholesalers ... backed by strategically located factory-warehouse stocks ... you get the extras that give you more value for your money: "life-of-building" support for all piping applications; special engineering aid on your special application problems; wide, wide selection from industry's most complete line ... the best quality hanger or support in the field!

There's a Complete Stock of Fee & Mason Pipe Hangers in Your Own Back Yard!

FEE & MASON

AMERICA'S LEADING SPECIALISTS IN PIPE HANGERS AND SUPPORTS

Since 1893

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THERE'S A F&M STOCKING WHOLESALER IN YOUR TOWN!

WHO'S WHAT . . .

(New personnel, promotions)

▸ *BELL & GOSSETT CO.*—R. Edwin Moore, president. Earl J. Gossett, will continue as chairman of the board of directors.

▸ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—John P. Soule, manager of commercial heating and cooling systems for company's plumbing and heating division.

▸ *AMERICAN GAS ASSOCIATION*—Frank E. Hodgdon, director of AGA laboratories.

▸ *AMERICAN WELDING SOCIETY*—J. J. Chyle, A. O. Smith Corp., president; Clarence P. Sander, United States Steel Corp., first vice president; G. O. Hoglund, Aluminum Co. of America, second vice president.

▸ *AMERICAN SOCIETY OF MECHANICAL ENGINEERS*—Leland S. Dennegar, director of public relations.

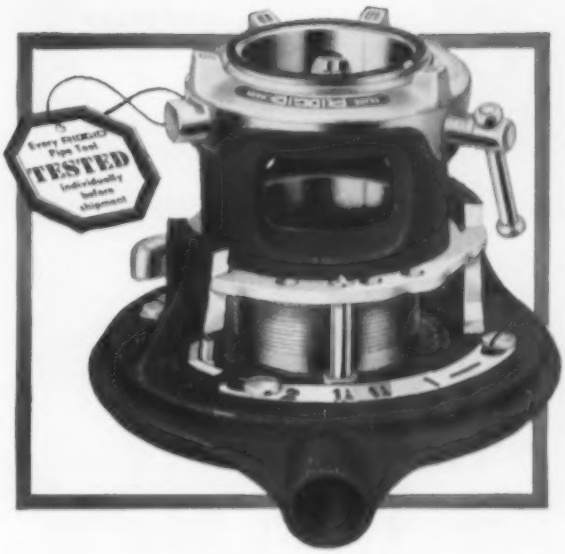
▸ *AMERICAN SOCIETY OF REFRIGERATING ENGINEERS*—Carlyle M. Ashley, chief staff engineer at Carrier Corp., president; Hermann F. Spoehrer, vice president and treasurer of Sporlan Valve Co., first vice president; Cecil Boling, president of Bush Mfg. Co., second vice president; Daniel D. Wile, vice president of Refrigeration Engineering, Inc., treasurer; Everett Palmatier, director of research at Carrier Corp., director; John Engalitcheff, Jr., president of Baltimore Aircoil Co., director; Robert G. Werden, industrial sales manager with York Corp., director; Charles T. Hamilton, consulting engineer, director.

▸ *WEBSTER ELECTRIC CO.*—David J. Munroe, president; Preston G. Crewe, vice chairman of the board of directors; J. O. Mithus, secretary-treasurer; O. F. Hansche, assistant secretary. New directors are Dr. Frank Driggs, John C. Harkness and Max Hess Weinberg.

▸ *ALBERT KAHN ASSOCIATED ARCHITECTS AND ENGINEERS, INC.*—G. S. Whittaker, a director; George H. Miehls, chairman of the board. Newly elected officiers are: Sheldon Marston, executive vice president; R. E. Linton, treasurer; G. K. Scrymgeour, secretary. New vice presidents are V. C. Wagner and Messrs. Scrymgeour and Whittaker.

▸ *DE LAVAL STEAM TURBINE CO.*—Willis McDonald, a director.

Nearest Thing
to Machine Pipe Threading



RIDGID
Jam-Proof 65R
saves you time, work and mistakes

Ready for work fast—you set 65R to pipe or conduit size in 10 seconds . . . self-contained 1″, 1¼″, 1½″, 2″ high-speed steel dies. Self-centering workholder sets to size instantly.

No mistakes—automatic kick-out prevents jamming when standard thread is cut. Workholder setting is mistake-proof.

Beautiful threads—perfectly threaded factory test sample in your new 65R proves it!

You can't beat RIDGID 65R for speed, easy work and long service. *Buy it at your Supply House!*

RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.

SOLENOID VALVES
Simplify Valve Selection
Reduce Inventory and Parts Stock

You can use *the same* J-E Solenoid Valve to control the flow of *any* of the above fluids, as well as air, brines, light oils, industrial gas, etc. In addition, one size coil (in a variety of voltages) and one plunger fit all valves regardless of size or capacity.

This versatility saves valuable time and trouble in selecting the proper valve for a wide variety of applications. Their unique "all purpose" design also saves important money by greatly reducing inventory and parts stock.

It will pay you to find out about *all* the advantages of J-E Solenoid Valves including . . . simple installation . . . dependable performance . . . quiet operation . . . easy maintenance. Then you'll know why they are being used with enthusiasm and satisfaction in hundreds of applications where other solenoid valves have failed.

Call your wholesaler or write direct today:

J-E *Controls Division*

JACKES-EVANS MANUFACTURING CO.

4427 Geraldine Avenue • St. Louis 15, Missouri

WHO'S WHAT *Continued*

▸ *STEEL BOILER INSTITUTE*—Davenport Kendall of Farrar & Trefts Div. of Adsco Industries, Inc., a director for a one-year term. Elected to three-year terms as directors are: J. F. Johnston, Jr., Johnston Bros., Inc.; H. H. Peek, Jr., Lockout Boiler and Mfg. Co.; James F. Sweeney, Struthers Wells Corp.

▸ *GREGORY INDUSTRIES, INC.*—Leonard C. Barr, vice president and director of operations; Maurice A. Enright, vice president and director of planning; Robert J. Kilmer, financial vice president and treasurer; Thomas A. Piraino, secretary and manager of administrative services; Robert C. Singleton, vice president in charge of engineering; Gene P. Hopkins, vice president in charge of manufacturing.

▸ *EUTECTIC WELDING ALLOYS CORP.*—Rene E. Wasserman, member of the National Board of Field Advisors of the Small Business Administration. Mr. Wasserman is president of Eutectic.

▸ *TRANE CO.*—Allen C. Menke, vice president, air conditioning and heating sales; R. H. Pearse, Jr., sales manager, air conditioning; William C. Dackis, manager, heat exchanger sales; A. James Hackl, sales manager, packaged equipment; Harry F. Griese, Jr., manager, "Climate Changer" sales; C. L. Ringquist, manager, applications engineering department; William A. Marshall, development engineer for company's product engineering department; Randall W. Johnson, assistant manager, transportation sales department. Wayne J. Hood, executive vice president and treasurer of the company, has been named to a four-year term as director by the Wisconsin Manufacturer's Association.

▸ *UNION ASBESTOS & RUBBER CO.*—Emil T. Johnson, general manager of fibrous products division.

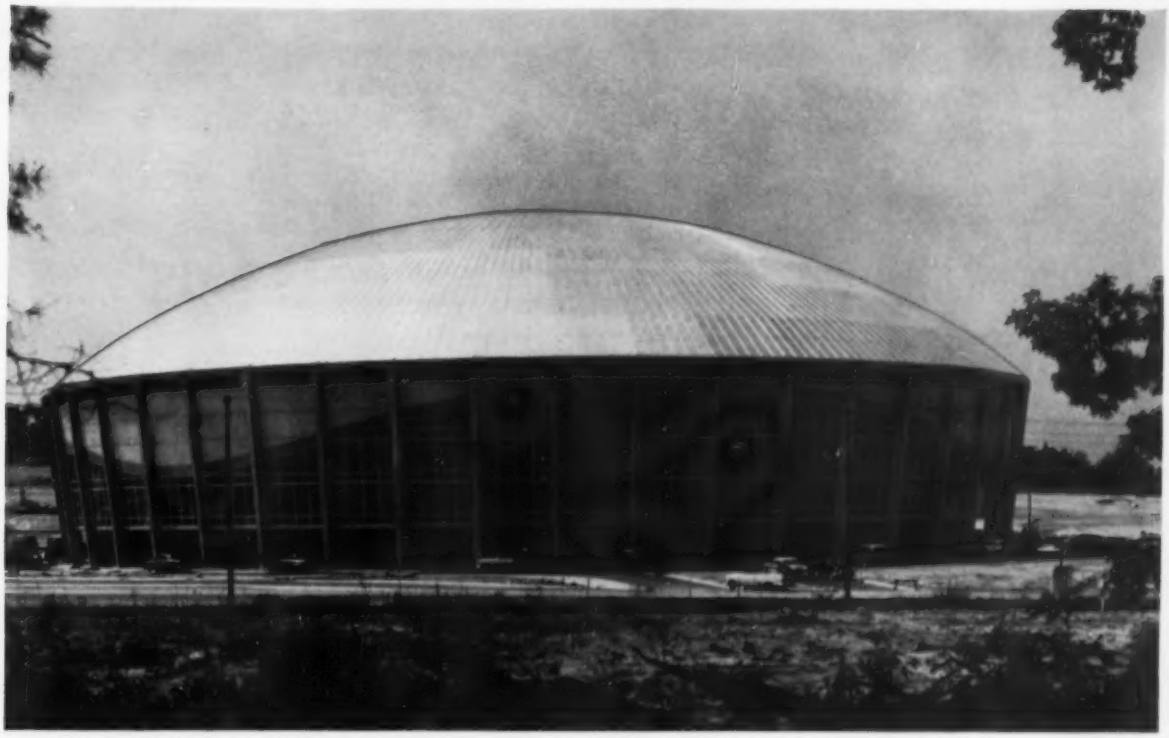
▸ *WARD LEONARD ELECTRIC CO.*—George M. Stapleton, vice president.

▸ *DRAYER-HANSON, INC.*—Arnold Erdal, sales engineer.

▸ *CURTIS MFG. CO.*—Edward O. Gotway, chief purchasing agent; Erwin A. Schulte, controller and assistant treasurer.

▸ *BAKELITE CO., DIV. OF UNION CARBIDE AND CARBON CORP.*—William J. Canavan, manager of extrusion materials division.

▸ *ENTERPRISE ENGINE & MACHINERY CO.*—T. Bruce Selfridge, manager of special products.



Marlo Heats and Ventilates Huge New Coliseum

Comfort conditioning the cavernous interior of this new 13,500-seat coliseum in Charlotte, N. C., is a man-size job. The huge aluminum dome, easily the world's largest at more than 332 feet in diameter, covers an area of two acres.

Heating and ventilating this unusual structure is accomplished by 22 Marlo Ceiling Units, with a combined capacity of 336,800 cubic feet per minute.

The building was designed by architect A. G. Odell, Jr. General contractor was Thompson & Street Co., mechanical contractor was Hopkins, Hicks and Ingle, and engineer was Mechanical Engineers, Inc., all of Charlotte.

One of the 22 Marlo heating and ventilating units suspended from the roof structure of the new coliseum.

Consult your Architect or Engineer—or write today for more detailed information on these and other Marlo Air Conditioning Units.

MARLO coil co.

SAINT LOUIS 10, MISSOURI

Quality Air Conditioning and Heat Transfer Equipment Since 1925

WHO'S WHAT

Continued

▸ *AMANA REFRIGERATION, INC.*—Elmer J. Dittrich, air conditioning application engineer.

▸ *STERLING, INC.*—Ross H. Dean, sales manager.

▸ *BURNHAM CORP.*—Virgil A. Good, a director; Albert J. Hall and Basil N. Greenlaw, vice presidents.

▸ *GOVERNAIR CORP.*—Patrick J. Shea, general sales manager.

▸ *EMERSON RADIO AND PHONOGRAPH CORP.*—Harry Schecter, vice president in charge of distribution.

▸ *L.O.F GLASS FIBERS CO.*—Robert T. Bailiff and John F. Newton, assigned as customer service assistants.

▸ *CORPS OF ENGINEERS, U. S. ARMY*—Dr. George W. Howard, technical director of research and development laboratories, Ft. Belvoir, Va.

▸ *AMERICAN ENGINEERING CO.*—Edgar Washburn, executive vice president; W. C. Miles, vice president and general manager, the post previously held by Mr. Washburn.

▸ *MODINE MFG. CO.*—Peter J. Kohler, sales engineer in company's industrial division.

▸ *COPELAND REFRIGERATION CORP.*—Charles Streck, factory manager of compressor manufacturing operations.

▸ *INTERNATIONAL NICKEL CO., INC.*—Albert P. Gagnebin and Harold Larsen, manager and assistant manager, respectively, of nickel sales department.

▸ *AEROVENT FAN CO., INC.*—Al W. Roth, manager of new large propeller division.

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—John R. Lenox, general manager of appliance controls division at Gardena, Calif.; Raymond S. Fries, factory manager of Gardena plant; Clyde A. Parton, director of ordnance and transistor divisions, the post held by Mr. Lenox, prior to his new appointment.

Your Best Buy In Condensate Pumps

Is The

EAGAN EAGLE!

This high quality unit offers you these outstanding advantages: *low initial cost; far more capacity than any other similar pump at the same price* (to 8000 sq. ft. EDR at 20 psi); *a low return inlet* (to eliminate need for a pit even though return lines are as low as a foot above the floor); *all bronze centrifugal pump* with a nonclogging open impeller, stainless steel shaft; *flexible connectors and coupling* (to isolate the pump, eliminate pipe cramp, wear and noise); *thermal overload protection; a level indicating float switch.*

These advantages — and many more — are yours for the asking with the Eagan Eagle. (other models available with capacities to 100,000 sq. ft. at 200 psi.)

Write for Bulletin and prices.

WALTER H. EAGAN CO., INC.

Pump Specialists Since 1920

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Philadelphia 30, Pa.

Send me information on the EAGAN pumps checked:

——Condensate——Boiler Feed——Centrifugal——Turbine
——Fuel Oil Pump & Heater Sets

Name .....

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Meet the tightest-coated sheet yet produced!

WHEELING

SOFTITE®

COP-R-LOY® GALVANIZED SHEETS

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This is Wheeling's Louisville warehouse. Other Wheeling warehouses and sales offices are strategically located throughout the country. They all offer immediate delivery of warehouse-stocked Wheeling items such as SOFTITE Cop-R-Loy Galvanized sheets, Galvanized Furnace Pipe, snap lock or closed seam Perimeter Heating or Air Conditioning Pipe, and accessories.

Think of the toughest test you can give a galvanized sheet. Then try it on a sheet of Wheeling SOFTITE. You've never seen anything like it. For here is a galvanized sheet that takes every roll, every bend, every crimp and fold without flaking or chipping its rugged coating. And for good reason. Because Wheeling SOFTITE Cop-R-Loy Galvanized Sheets have the tightest zinc coating yet produced.

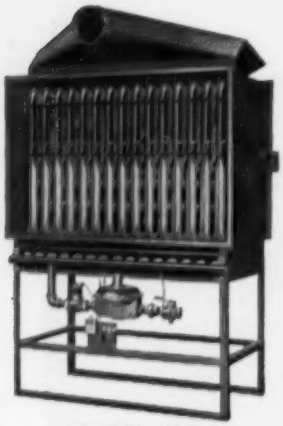
What this means to you is tighter joints, surer seams, longer spans . . . jobs that look better, last longer, give utmost satisfaction.

Next time you order galvanized sheets, remember, only *Wheeling* makes SOFTITE and only SOFTITE has the tightest coating ever.

Get full details now. Write, wire or call the Wheeling warehouse or sales office nearest you.

WHEELING CORRUGATING COMPANY, WHEELING, WEST VIRGINIA

Warehouses: Boston, Buffalo, Chicago, Columbus, Detroit, Kansas City, Louisville, Minneapolis, New Orleans, New York, Philadelphia, Richmond, St. Louis. **Sales Offices:** Atlanta, Houston.



MODEL SED-E

MODEL SED-S

MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.

MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built-in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty, variable pitch drives, raised port burners. 80,000 to 600,000 Btu input.

MODEL SEC

HAYES

FURNACES

outstanding for · commercial, industrial, schools, churches, theaters, large residential

HAYES FURNACE MFG. & SUPPLY CO.

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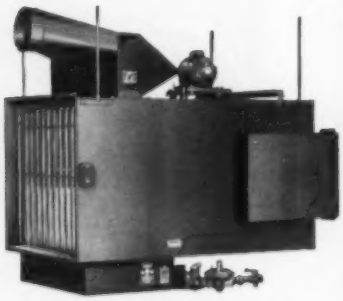


MODEL SES

MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with drilled ports. Oversize double inlet blower, glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input. For zero clearance.

REPRESENTATIVES

M. Blazer & Son, Passaic, New Jersey.
Blue Flame Supply Company, Atlanta, Georgia
Eugene Bolsted, Edmonton, Alberta, Canada.
E. B. Bomar, Phoenix, Arizona.
Boyd Engineering Co., El Paso, Texas.
Reube O. Emery, Nashville, Tennessee.
F & D Distributors, Salt Lake City, Utah.
Leudecke Engineering Co., Austin, Texas.
McCombs Supply Co., Denver, Colorado.
O'Conner-Oklahoma Co., Oklahoma City, Tulsa, Oklahoma & Wichita, Kas.
Smith Steam Specialty Co., Kansas City, Mo.
Tay-Holbrook, Inc., San Francisco, California.
F. R. Young, Houston, Texas.
Dealers Supply Company, Atlanta, Georgia.
Jewell & Company, Hot Springs, Arkansas.
Nunn Electric Co., Lubbock, Texas.
Noland & Co., Newport News, Va.
Temp-Control Corp., Portland, Oregon

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.

WHO'S WHAT

Continued

▸ *CARRIER CORP.*—Appointments within Unitary Equipment Div. are: Burton T. Kehoe, assistant to general manager; Arthur E. Meling, manager of Weathermaker department. Frank H. Burgemeier has joined company's public relations department as national publicity representative.

▸ *FRED S. DUBIN ASSOCIATES*—Harold L. Mindell, partner; Peter S. Myers, associate engineer; George J. Giannoni, head of electrical department; Sidney J. Greenleaf, project engineer.

▸ *DOLE REFRIGERATING CO.*—W. E. Lauterbach, chief engineer.

▸ *HANDY & HARMAN*—Francis H. Wemple, a director. He was elected treasurer in 1954.

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *J. F. PRITCHARD AND CO. OF CALIFORNIA*—A. Gonzalez-Flores, sales representative for all of Mexico.

▸ *WHEELCO INSTRUMENT DIV., BARBER-COLMAN CO.*—Instruments, Inc., representative for industrial instruments and combustion safeguards in Tulsa area. Wheelco's Seattle branch office has relocated to Boeing Field in that city. The Clinton, Conn., branch has moved to 27 Wallace Ave., Wallingford, Conn.

▸ *BABCOCK & WILCOX CO.*—Seth M. Snyder, manager of Charlotte, N. C., district sales office of company's boiler division.

▸ *MUELLER CLIMATROL*—Dan Phillips and Edward Knott, to cover metropolitan Toronto and northern Wisconsin, Upper Michigan Peninsula territories, respectively.

▸ *TRANTER MFG., INC.*—Process Instruments & Equipment Co., "Platecoil" distributor in Charleston, W. Va., area.

▸ *PENN CONTROLS, INC.*—Berkeley, Calif., office has relocated to 2729 San Pablo Ave. in that city. Company's office at Milwaukee is moved to 1351 W. North Ave., there.

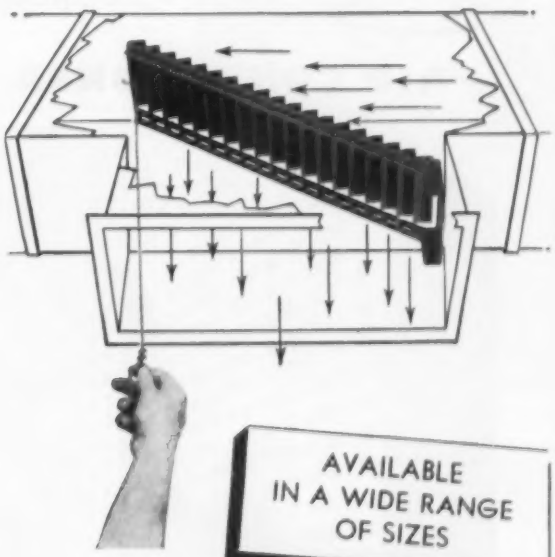
NOW . . . *Divert Air Where You Want It!*

A-J

AIR "EXTRACTOR"

This new A-J Air Extractor gives you maximum control of any forced air system. It's not a "damper type" control to meter available air flow through a grille, but a "scoop" that diverts air from the main duct to branch ducts or grilles and increases output over normal flow where needed.

The curved steel blades of the A-J Extractor are adjustable and act in unison to provide a controlled and uniform flow of air in branch ducts. A single key rod provides fast and easy adjustment through the face of a grille or register, and eliminates need for removal. The extractor is sturdily constructed, and fastened in the duct with two screws. Velocity of the air will not alter setting. Write for full information and prices.



AVAILABLE IN A WIDE RANGE OF SIZES

FREE Catalog

listing, describing and pricing 1,000 types and sizes of grilles, registers, etc.

A-J MANUFACTURING Co.

3601 E. 18th St. Dept. H-7 Kansas City 27, Mo.

WHO'S WHAT

Continued

▸ *L. O. F GLASS FIBERS CO.*—New distributors and their territories for fine fiber insulation material are: Mundet Cork Co., Philadelphia; Power Engineering Corp., Wilkes Barre, Pa.; General Theatre Supply Co., Canada, except for Ontario; Ardco Distributors, Atlanta; Glass Fibers Insulation Corp., Houston; Eastern Glass Co., Portland, Me.; Illinois Fibre Specialty Co., Inc., Evansville, Ind.; Joseph Cashier & Co., Inc., Syracuse; Fischer Lime & Cement, Little Rock; Barco, Inc., Luverne, Minn.; Panhandle Steel Buildings, Inc., Amarillo, Tex.; Keystone Supply, Inc., Oklahoma City.

▸ *POWERS REGULATOR CO.*—New sales engineers and territories to which assigned are: William P. O'Connor, New York; George J. Salmon, Washington; Leo P. Christiansen and Finn Litsheim, Minneapolis.

▸ *LEWYT AIR CONDITIONER CORP.*—New distributors and territories are: Gerber Electric Supply Co., Ft. Wayne; J. H. Larson, Minneapolis; Le Stourgeon Distributing Co., Charlotte; R. T. A. Distributors, Albany; Morris Distributing Co., Syracuse.

▸ *INSTO-GAS CORP.*—Transfers are: Donald Edwards, from central to southern territory, with headquarters in Atlanta; Arthur Lacroix, from midwest to central territory, with headquarters in Detroit; Bert Felzer, from New England to midwest territory, with headquarters in St. Louis. Appointments are: Lamco, New England representative; Richard Grace, to cover Florida.

▸ *NATIONAL-U. S. RADIATOR CORP.*—Barry Austin, representative for heating, air conditioning equipment in Ontario, Quebec, New Brunswick.

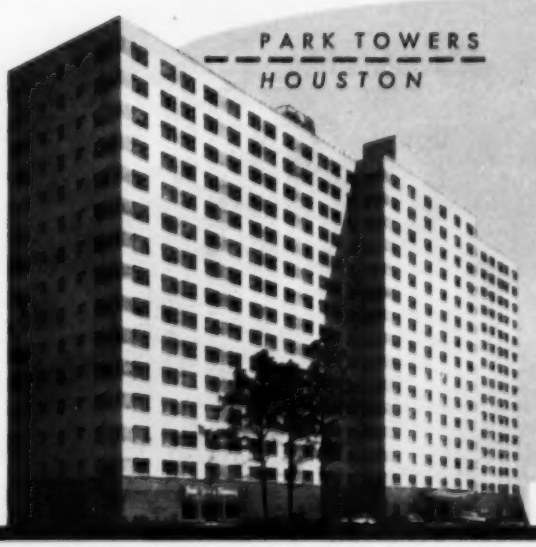
▸ *WHIRLPOOL-SEEGER CORP.*—Morley Bros., air conditioner distributor in Saginaw and Lansing, Mich., territories.

▸ *GENERAL ELECTRIC CO.*—T. King McCreery, Inc., wholesaler for "Weathertron" heat pump in parts of Pennsylvania, West Virginia, New York.

▸ *INLAND STEEL PRODUCTS CO.*—Charles A. Gomer, sales manager for Baltimore district; Randall A. Burr, sales engineer in metropolitan Philadelphia; Lawrence D. Coffman, sales representative in Cincinnati branch area.

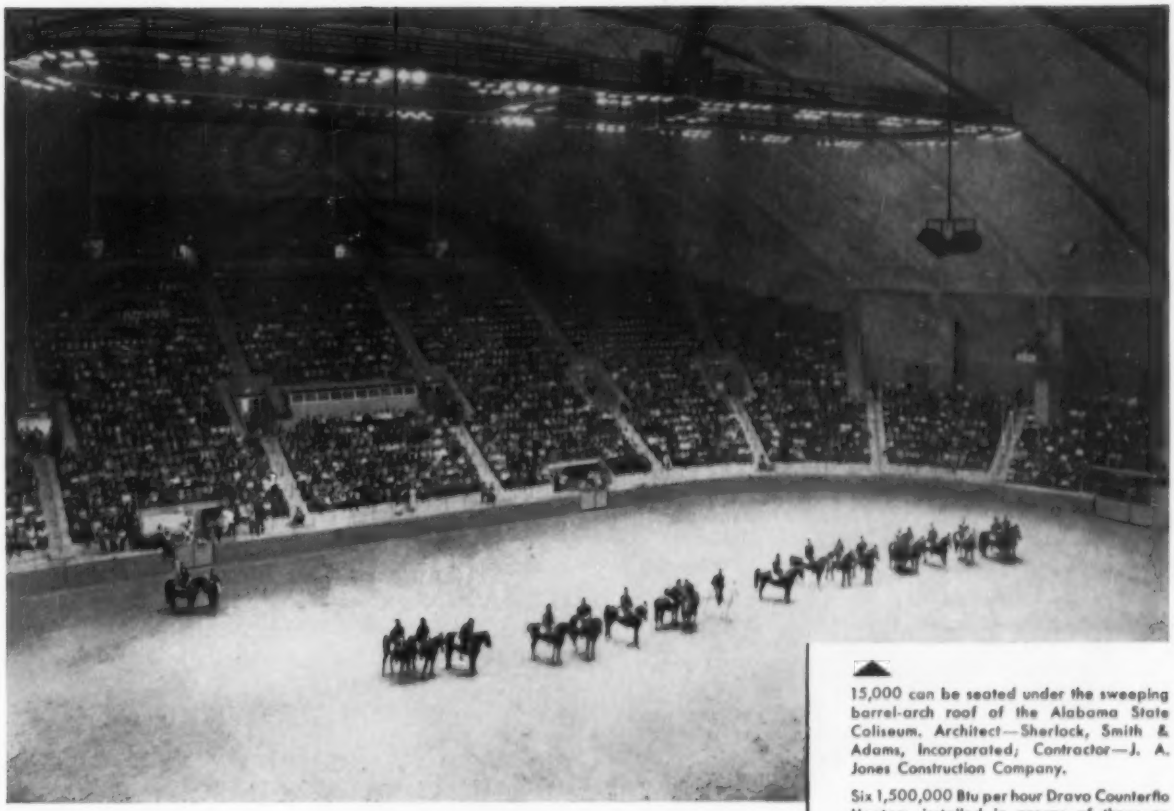
Cost Wise.. Comfort Wise... Maintenance Wise

AIR CONDITIONED BY International



Teamwork in planning . . . combining the architecture of Leon, Lionel & Levy, engineering by C. J. Wurmfeld, air conditioning by International, and installation by Charles G. Heyne Co. . . . has produced the kind of air conditioning system that's pleasing to all concerned.
Pleasing to the builder for its low initial cost. (The International console hideaways require no duct work.) Pleasing to occupants of Park Towers for its quiet operation. And pleasing to the management for its trouble-free maintenance. Get the International story yourself . . . soon! Call or write.

INTERNATIONAL MANUFACTURING CO., 600 E. GRAND • OKLAHOMA CITY • CABLE: INTIME



15,000 can be seated under the sweeping barrel-arch roof of the Alabama State Coliseum. Architect—Sherlock, Smith & Adams, Incorporated; Contractor—J. A. Jones Construction Company.

Six 1,500,000 Btu per hour Dravo Counterflo Heaters, installed in groups of three on opposite sides of the arena, operate automatically to provide heat as needed. A seventh Dravo Counterflo, rated at 500,000 Btu per hour, heats the basement.

How Alabama solved unusual heating problems in its new Coliseum

Keeping the new Alabama State Coliseum at Montgomery comfortable posed many unusual problems for heating engineers. Size alone presented a big enough problem—the building is 10 stories high and almost the length of an average football stadium—but added were many special conditions.

When the building is empty heat loss amounts to 9,800,000 Btu per hr, but when filled, body heat sometimes raises temperatures enough that heat and humidity must be removed. The large open area also makes it difficult to provide uniform, easily controlled heat at all seating levels. Other rigid requirements include concealment of heaters to permit unobstructed visibility and quiet operation. With the aid of seven Dravo *Counterflo* Heaters the engineers solved all these problems.

Installed under the stands of the arena are six Dravo heaters that pull in fresh and return air in proportion to the Coliseum's needs. This air is quickly heated by the Dravo units and quietly distributed to all parts of the building. Functioning with the heaters is a sensitive temperature-humidity control system that operates the heaters or a series of exhaust fans, according to on-the-spot heat-ventilation requirements. The fully modulated *Counterflo* Heaters, with their stainless steel combustion chambers, are ideally suited for this precise job of providing instantaneous heat delivery when needed—or fresh tempered make-up air when ventilation is required.

Just as they've economically solved the unusual heating problems in this huge Coliseum, Dravo heaters can effectively meet your needs, large or small. For fast proof, use the coupon.

Dravo Corporation, Department A-1407
Fifth & Liberty Avenues
Pittsburgh 22, Pa.
I am interested in Dravo Heaters for

_____

☐ Please send literature
☐ Please have a representative call

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

DRAVO
CORPORATION
Pittsburgh 22, Pennsylvania
Representatives in principal cities

you get **MORE** back
because you put in

APCO HORIZONTAL CONDENSATION RETURN UNITS
with Cast Iron Tanks
"by Aurora"

APCO Horizontal Simplex Condensation Return Unit — Cast Iron Tank — Also Available in Duplex

These horizontal units are used where the returns are above boiler room floor level. They deliver a plus of performance values through extra years of dependability.

OTHER RETURN UNITS
"by Aurora"

TYPES HR & LR APCO-MATIC for LOW RETURNS 800 to 10,000 E. D. R. Pressures to 80 P. S. I. Simplex or Duplex

•

APCO Packaged Square Tank UNITS for these Small, Low Pressure Jobs 10 to 40 Lbs.

•

AURORA VERTICAL for BELOW FLOOR LEVEL RETURNS to 100,000 Sq. Ft. Rad. and to 150 G. P. M.

•

WHATEVER YOUR PROBLEM AURORA CAN MEET IT

APCO handles hot water perfectly

•

Will not Vapor Bind or Lock

•

Free-running Clearance Allows Expansion Due to Heat

•

No Steam Flashing

•

Equallized Pressure Makes for Longest Pump Life

•

Automatic Range Adjustment Assures Functioning Against Widely Varying Heads or Pressure Conditions

•

In Sizes up to 40,000 Ft. Radiation, Maximum Capacity 60 G. P. M. and Maximum Pressures up to 115 P. S. I.

•

Try Them. They'll Win YOUR Favor, Too.

Write TODAY for Bulletin H-113 or Submit Your Problem to Our Engineers

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AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
80 LOUCKS STREET • AURORA • ILLINOIS
INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

WHO'S WHAT

Continued

▸ *A. O. SMITH CORP.*—New distributors are: Forest City Electric Supply Co., Rockford, Ill.; Northwest Oil & Equipment Co., Moorhead, Minn.; Bush Supply Co., Harlingen and McAllen, Tex.; Service Supply Co., Victoria, Tex.; Mainline Supply Co., Inc., Dayton; Booth & Thomas, Springfield, Ill.; Sam Klain & Son, Indianapolis; Paul Mueller Co., Springfield, Mo.

▸ *WESTINGHOUSE ELECTRIC CORP.*—W. Y. Humphreys and E. F. Morse, district managers for Pittsburgh and Cleveland, respectively, for company's Sturtevant Div.

▸ *MUELLER BRASS CO.*—William A. Preininger, district manager of Denver territory. Sales representatives and the offices to which they are assigned are: Wayland Swanson, Chicago; George I. Duddy, Cincinnati; Richard J. Williams, Dallas; John G. DeNardin, Indianapolis.

▸ *AMANA REFRIGERATION, INC.*—Angus T. Shearer, sales manager of new Memphis region.

▸ *REFRIGERATION ENGINEERING, INC.*—J. C. Lewis, southwest district manager. New distributors and their territories are: M & V Supply Co., Oklahoma; F. J. Evans Engineering Co., Houston; R. F. McAndrews Co., Cincinnati.

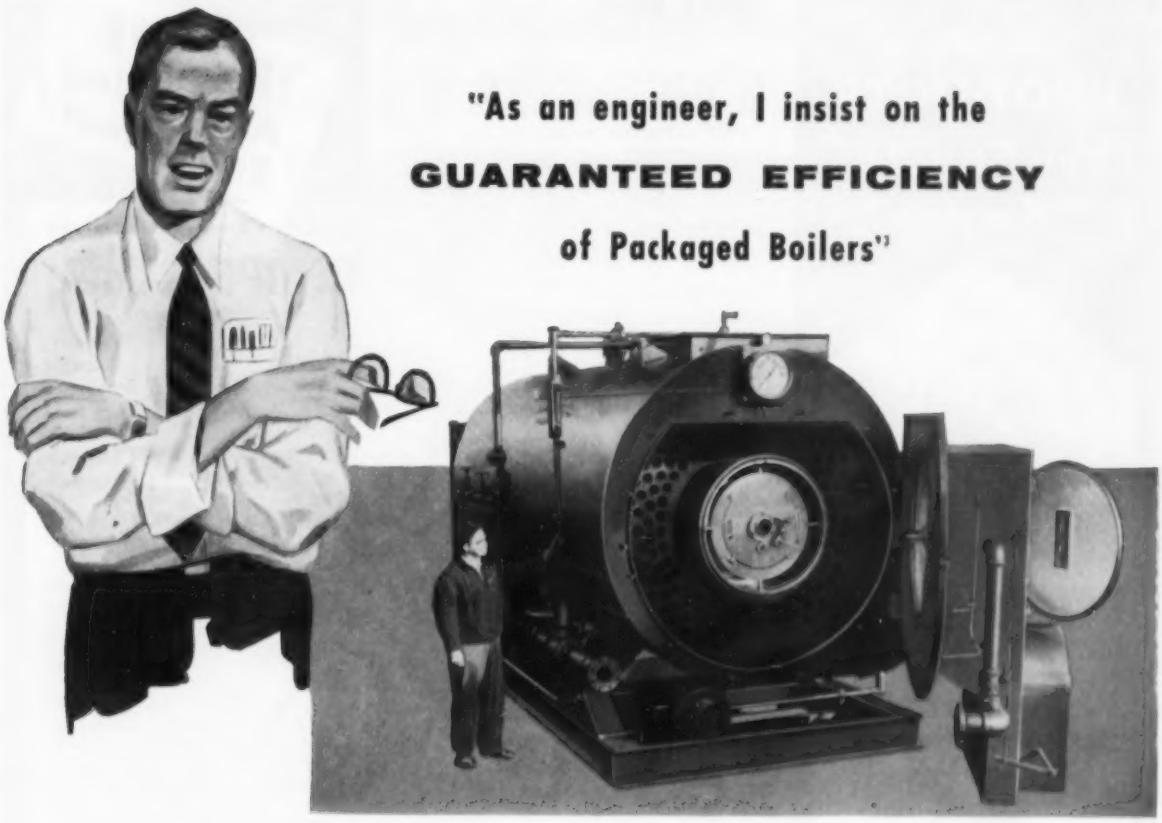
▸ *LIMA ELECTRIC MOTOR CO.*—Arthur C. Beesley, head of new branch office at Cleveland.

▸ *O. A. SUTTON CORP., INC.*—Bernard M. Frawley, general sales manager for Vornado Distributing Co., Inc., in Baltimore.

▸ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Sam Robb, relocated to company's general sales offices to assume new responsibilities; W. J. McGonigle, representative in New York area.

▸ *TORIT MFG. CO.*—District sales representatives and their territories are: Taze and Hewitt, Maryland; Union Supply Co., Colorado, eastern Wyoming; Byron Confer, southern Indiana, most of Kentucky.

▸ *MITCHELL MFG. CO.*—CBS-Columbia of Detroit, distributor for room air conditioners in Detroit area.



"As an engineer, I insist on the GUARANTEED EFFICIENCY of Packaged Boilers"

"Boiler efficiency used to be an X factor – an unknown gamble where the odds were stacked against the buyer. No engineer likes to gamble, so we used to recommend oversize boilers, just to play it safe.

"Then, to answer a major industrial need, the Packaged Boiler was developed. With its *guaranteed efficiency* of 80%, it eliminates all our guesswork. Now we can specify exactly the right size boiler for every job. When plant expansion calls for greater steam production, additional Packaged Boilers can be added – easily, economically, conveniently.

"Packaged Boiler efficiency doesn't fluctuate, either. It stays almost constant throughout a wide load range . . . and throughout the long life of the boiler."

Six Reasons Why it Pays to Buy a

CONTINENTAL

Automatic Boiler

* Guaranteed 80% efficiency . . . Fire-tested before shipment . . . Range, 20 to 500 hp.
* Simple, practical two-pass design, for uniform flow of combustion gases through all return tubes.
* Maximum radiant heat transfer achieved by "Spinning Gas" technique for thorough mixing of air and atomized fuel.
* High-CO_2 and low-temperature stack gases — proof of high combustion efficiency.
* Free, rapid water circulation improves heat transfer, keeps heating surfaces clean.
* Easy access to furnace and all return tubes. Refractory baffles and brickwork are not required.

For details on the Continental Automatic Boiler, send for Bulletin BE-3

BOILER ENGINEERING & SUPPLY COMPANY, INC.

8 Manavon Street, Phoenixville, Pa.

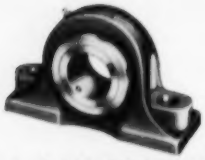
A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

The Continental AUTOMATIC BOILER

DODGE PRODUCTS You Should Know-

BRONZOIL BEARINGS

SLEEVOIL BEARINGS



SC & SCM BEARINGS

Dodge Bulletins you should have-

- ☒ Bronzoil Self Oiling Bearings. Dimensions and selection data.
- ☒ Sleevoil Bearings. Dimensions and selection data on plain and water-cooled types. Bulletin A-401-C.
- ☒ Rolling Bearings. Load ratings, dimensions and other data on SC and SCM Ball Bearings and Dodge-Timken Roller Bearings. Bulletin A-638.

Write for your copies.

DODGE of Mishawaka, Ind.

DODGE MANUFACTURING CORPORATION
1600 Union Street • Mishawaka, Indiana

WHO'S WHAT *Continued*

▸ *VIKING AIR PRODUCTS, DIV. OF NATIONAL-U. S. RADIATOR CORP.*—Pacific Scientific Co., representative for Oregon, Washington.

▸ *YOUNGSTOWN SHEET AND TUBE CO.*—Appointed district sales managers are: R. P. Broadhurst, Chicago; C. Hix Jones, Dallas.

▸ *INLAND STEEL PRODUCTS CO.*—A. V. Randazzo, manager of Buffalo branch; William C. Kneer, sales manager in Connecticut, Rhode Island, western Massachusetts; Joseph F. Davis, sales engineer for Maryland; Theodore C. Johnson, representative in St. Louis branch areas of Alabama, Arkansas, Mississippi, Tennessee; Ben F. Kracht, representative in New Orleans area.

▸ *LEWYT AIR CONDITIONER CORP.*—Sidney Buss and Jack Weisman, named national district managers.

▸ *DOLE REFRIGERATING CO.*—Leonard E. Gustafson, district representative in Texas, Louisiana, Mississippi.

▸ *OSTER MFG. CO.*—Goodin Co. has doubled existing warehouse facilities with the purchase of a new building in Minneapolis. Goodin covers Minnesota, western Wisconsin, eastern North Dakota for Oster. A & J Friedman Supply Co., Inc., has added David A. Chester to its sales staff to cover northern New Jersey, New York, Pennsylvania.

▸ *FENWAL, INC.*—Thomas H. Closs Co., to represent in eastern Maryland northern Virginia, District of Columbia.

▸ *W. M. KELLOGG CO.*—William R. Dunn, sales manager of newly established western regional office at San Francisco; Paul S. Jones, to assist Mr. Dunn.

REMPE Air Cooling Equipment

Complete • Compact • Adaptable

REMPE Atmos-Therm®

The only Air-Cooled Condenser with these two Essential Features:

DESUPERHEAT SECTION
Large volume gas inset section. Hot gas from compressor expands slightly to accelerate its transfer from a dry gas to a wet vapor.

AIR BLEEDER BAFFLE
Return Bend Cover Plate perforated to permit measured amount of air to be directed over bends and headers.

- Completely eliminates need for condenser water.
- Minimizes operating and service expense.
- Inside or outside installation.
- Outlasts cooling towers and evaporator condensers.

REMPE Complete Line of Air Cooling Coils

2 to 15 Ton Capacities

Complete with Multi-Outlet Expansion Valves—Made-On—Ready to Install

4 ROW COILS—for residential jobs.
6 ROW COILS—for commercial jobs.

Precision engineered and built to insure top performance and to give trouble-free service.

When writing mention product.

We have complete facilities for fabrication of pipe coils—all types—all materials. Complete engineering service. Send details.

HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890 REMPE COMPANY

342 N. Sacramento Blvd., Chicago 12, Ill.

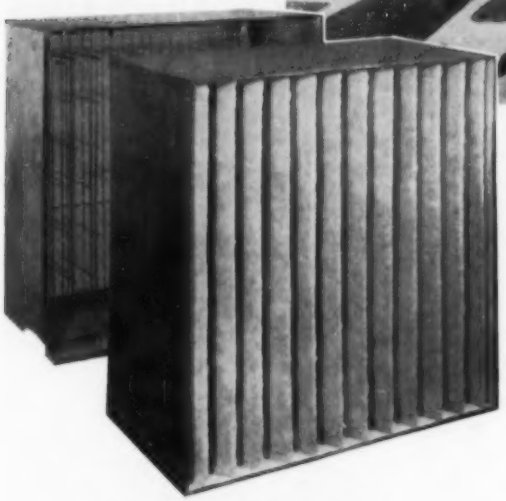
Another Outstanding Building Selects Cambridge Aerosolve Filters...

State Mutual Life Assurance Company
Worcester, Mass.

Cram & Ferguson
Architects — Engineers
Boston

Turner Construction Co.
General Contractor
Boston

C. H. Cronin, Inc.
Mechanical Contractor
Boston



Cambridge AEROSOLVE Filter

for Greatest Economy in High-Efficiency Air Filtration

Cambridge Aerosolve 95 Filters will keep 289,500 c.f.m. of air in the new State Mutual Building free not only of ordinary dust but also of the sub-micron smudgy carbon particles that go right through ordinary filters. Initial and owning and operating costs will be lower than with any other type of air-cleaning device of comparable efficiency.

Large dirt-holding capacity; no maintenance except infrequent, easy cartridge replacement; absence of power, drains and water lines – all contribute to the economy of these highly efficient filters.

There are no electrical circuits or mechanical moving parts to fail. Aerosolve filtration is positive filtration – always reliable and trouble-free.

Other Typical Aerosolve Installations

- Commercial and Industrial Buildings
- Hospitals and Scientific Laboratories
- Restaurants and Clubs
- Auditoriums and Conference Rooms
- Universities, Libraries and Retail Stores
- Private Homes
- Processing Areas

Compare These Efficiencies

National Bureau of Standards Discoloration Test with Atmospheric Dust

Cambridge Aerosolve 95	90-95%
Cambridge Aerosolve 85	80-85%
Electrostatic Precipitator	85-90%

For even more critical air cleaning problems, inquire about the Cambridge Absolute Filter, by far the world's most efficient air filter.

Write for
AEROSOLVE Filter Bulletin 105A
ABSOLUTE Filter Bulletin 106 A

CAMBRIDGE FILTER CORP.

Pioneers in High-Efficiency Air Cleaning

732 E. Erie Blvd. **Syracuse 3, N. Y.**

Representatives in Principal Cities

PALMER
MERCURY ACTUATED

DIAL THERMOMETERS

in 3 types to suit any requirements

PATENTED

Full 4½" dial face. Stem can be placed at any angle and case can be rotated to any readable position.

1 **Rigid Stem Dial Thermometer** tapered bulb, interchangeable with standard industrial thermometer separable socket. (As illustrated above.)

2 **Wall Mounted Dial Thermometer** with flexible connecting armor. Case adjustable to easy reading position.

3 **Flush Mounted Dial Thermometer** for panel mounting with flexible connecting armor.

All three types have a full 4½" dial face.

for accuracy: Mercury actuated . . . Fully Compensated by Invar Compensaton. Guaranteed Accurate 1 scale division.

for angularity: Can be adjusted to most readable position at any angle desired.

for readability: Bold Black Numbers . . . 11" of scale Reading Dial face can always be placed in easiest readable position.

for interchangeability: Always specify "PALMER" Separable sockets as they are interchangeable for Dial or Industrial type Thermometers.

Write for catalog information.

PALMER
THERMOMETERS, INC.
Norwood Ave., Cincinnati 12, Ohio
Mfrs. of Industrial Laboratory Recording and Dial Thermometers

WHO'S WHAT — *Continued*

▸ *MODERN ENGINEERING CO.*—David D. May, factory sales representative covering south central states. He will headquarter in Memphis.

▸ *TRANE CO.*—Richard E. Jameson, sales representative in charge of new sales suboffice in Sioux Falls, S. D.; Henry E. Woodward, added to New York City staff as sales engineer. New sales office addresses are: Miami, 2009 W. S. First St.; Billings, 403 N. 24th St.

▸ *JOSEPH T. RYERSON & SON, INC.*—Howard A. Stai, manager of tubular steel products and cold finished steel bar sales at Seattle steel service plant. He succeeds Loren G. Clay, transferred to Los Angeles in a similar capacity.

▸ *TENNEY ENGINEERING, INC.*—Alta Engineering Co., sales engineering representative for Rocky Mountain area; George P. Walker and Co., a similar appointment for Minnesota.

▸ *THERMO-PANEL DIV., DEAN PRODUCTS, INC.*—Sales representatives and the territories they will cover are: Cameron Engineering Co., northern half of California, Washoe county in Nevada; Allan Edwards, Inc., Oklahoma, Arkansas, Texas Panhandle; Thermal Specialties Co., central Pennsylvania; Merle Steam Equipment, eastern half of Michigan; J. F. Munn Co., western Maryland, western Pennsylvania, most of West Virginia.

▸ *SQUARE D CO.*—William Younger, eastern sales manager; William Moriarty, distributor sales specialist.

▸ *O. A. SUTTON CORP., INC.*—Howard Smith, district sales manager for Atlanta, Chattanooga, Knoxville, Jacksonville, Miami areas.

▸ *WHIRLPOOL-SEEGER CORP.*—John Fellmann, midwestern regional manager. ⧺

CAPITOL
SOCKET WELD
COUPLINGS and CAPS

for permanent high pressure installations

More and more socket-weld couplings are being used. CAPITOL makes every type of coupling required by industry. Now you can obtain all your coupling requirements from one source.

Socket Weld Couplings and Caps are available promptly from stock —

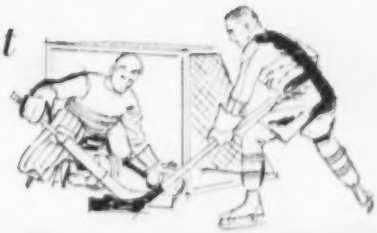
for
EXTRA PROFIT
order all your coupling requirements from

CAPITOL
MFG. & SUPPLY CO.
COLUMBUS, OHIO

COUPLINGS — NIPPLES — UNIONS — RADIANT HEAT FITTINGS — FURNACE COILS — WELL SUPPLIES — STEEL PIPE FITTINGS

Anybody for tennis... or hockey?

Dual rink-court freezes ice fast with 10 miles of steel pipe



What is in summer a court for tennis and other sports and in winter an artificial ice rink - - the first in Vermont - - is the proud acquisition of Middlebury College. In the huge memorial Field House and Gymnasium, about 52,000 ft. of 1-inch steel pipe assures rapid, solid freezing of the 85′ x 185′ rink when the asphalt topping of the sport court is flooded with water.

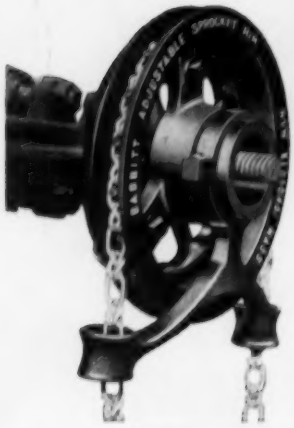
As at Middlebury, most of the collegiate and professional ice rinks of the country depend on steel pipe to carry the refrigerant . . . additional demonstration that *steel pipe is first choice* for plumbing, radiant heating, fire sprinkler systems, snow melting, structural applications, oil, gas and water lines. In fact, steel pipe is the most widely used pipe in the world!

Several interesting booklets are available for the asking . . . "*Steel Pipe in American Life*," "*Radiant Panel Heating with Steel Pipe*" "*Steel Pipe Snow and Ice Removal Systems.*"

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
150 East 42nd Street, New York 17, N.Y.

Steel Pipe is First Choice

NEW! Re-Designed



Babbitt
—Adjustable—
SPROCKET RIM
with Chain Guide

ANY VALVE is readily accessible *from the floor* with low-cost Babbitt Sprocket Rim. Now re-designed for—

- **Greater strength**
- **Easier, quicker, more solid assembly**

Simplifies pipe layouts, prevents accidents, fits all valve wheels. Your supplier carries complete stocks. Call him—or write for folder and prices.

Babbitt STEAM SPECIALTY CO.

8 BABBITT SQUARE, NEW BEDFORD, MASSACHUSETTS, U. S. A.

FUEL-AIR CONTROLLERS
ELECTRIC POWER UNITS
AIR SAFETY SWITCHES
INDICATING INSTRUMENTS
DRAFT REGULATORS
CONTROL PANELS
AUTOMATION IN COMBUSTION
CLEVELAND SEQUENCE DRAFT
Control Systems
• For all methods of firing
• For natural or induced draft
• Fully modulating
• All electric operation
FEATURING
• Lo-Draft Safety Switch
• Time Delay for Nuisance Puffs
• Starting Draft Selector
1 2 3
Typical schematic of "Cleveland" Draft Control System taken from FREE booklet.
Free
Ask for booklet, "Control Fundamentals and Their Application to Combustion"
CLEVELAND CONTROLS
1111 BROOKPARK ROAD • CLEVELAND 9, OHIO
Controls by "Cleveland"—Every Location in the Nation
Over 100 Sales Engineers Ready to Serve You
UL

WE HEAR THAT...

▸ After 26 years at its old location, *AIR REDUCTION CO., INC.*, has moved its executive offices into the new Socony-Mobil Bldg., New York.

▸ Construction by *POWERS REGULATOR CO.* of new office-warehouse buildings in Detroit and Houston has begun. With 11,000 sq ft of air conditioned space, the Detroit facility will cost $180,000. The $30,000 Houston building will have 2000 sq ft.

▸ *BRYANT DIV. OF CARRIER CORP.* has begun construction of an administration and engineering research building at Indianapolis. Upon completion of the new building, Bryant will move its offices from their present downtown location at 48 Monument Circle to 2020 Montcalm St., in that city.

▸ *ILG ELECTRIC VENTILATING CO.* marked its 50th anniversary with a recent plant open house attended by some 1800 employees and their families and friends, customers, suppliers and others. The visitors followed a well-marked route through the big plant to see operations such as the induction brazing of unit heaters, insulation of special fan motors, balancing of fans, and other manufacturing processes, as well as special displays, including an exhibit of fan wheel development over half a century.

▸ *CARRIER CORP.* officials *EUGENE STUFFING*, safety director, and *LARS HANSON*, manager of compressor department, attended a recently held Conference on Occupational Safety. On invitation from President Eisenhower, the conference was held in Washington.

▸ *BALTIMORE AIRCOIL CO.* is back in production after the fire that destroyed its offices and manufacturing plant on Feb. 2. Construction of a new plant is under way and is expected to be finished and in full operation by August.

Duriron Acid Resisting Drain Pipe

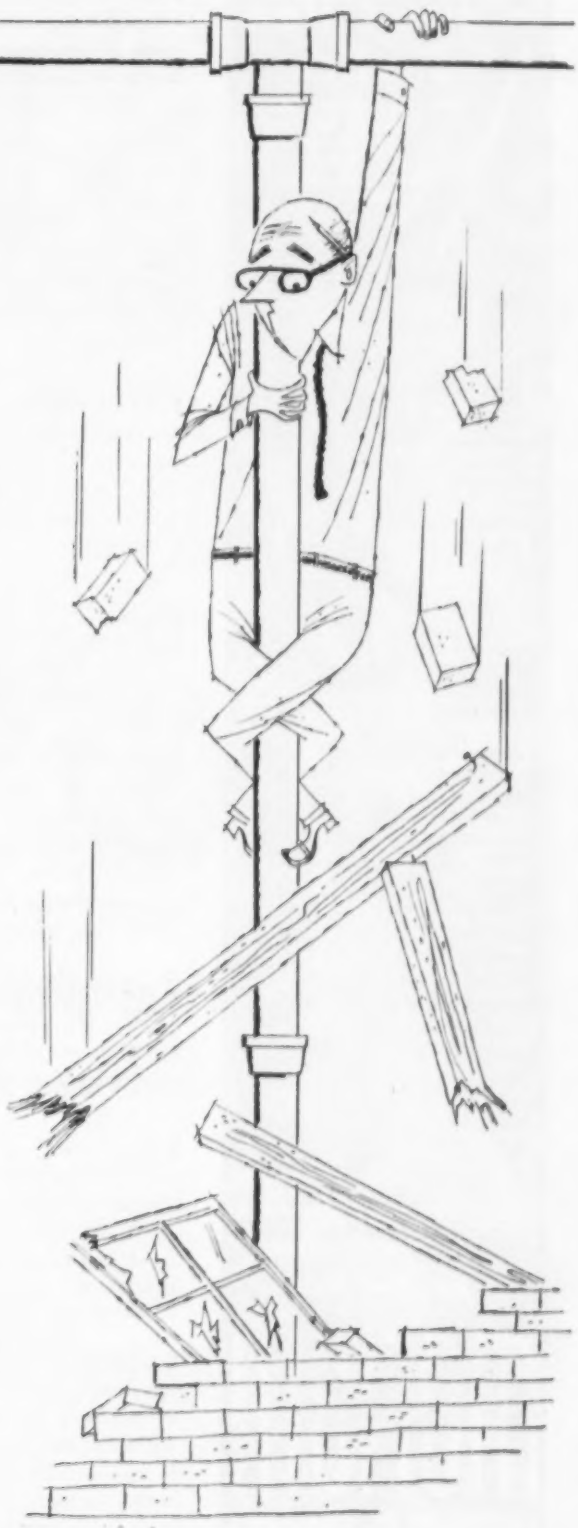
DURIRON® generally outlasts the building

Specify DURIRON for *permanent* drain lines to handle acids and other severe corrosives. DURIRON is a high silicon iron that is corrosion resistant throughout. It is not a coating. DURIRON is resistant to practically all commercial acids and many other corrosive solutions.

DURIRON has been proved by many years' service in schools, hospitals, laboratories, kitchens, plating rooms, and in many other applications where the economics of good building call for permanent drain lines.

A complete line of DURIRON bell and spigot pipe and fittings is carried in stock by leading wholesalers in principal cities throughout the country. Write for free bulletin PF/4a or see Sweet's Architectural File.

DURIRON is also available with split flange connections for pressure lines. Details are contained in Bulletin PF/2.



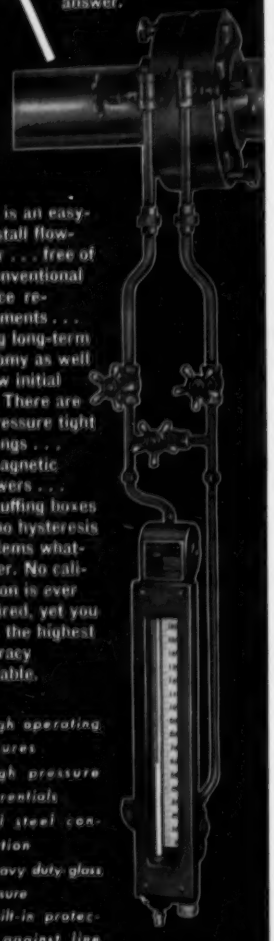
THE DURIRON COMPANY, Inc.
DAYTON, OHIO

DURIRON
LOOK FOR THE NAME ON EVERY PIECE

UNMATCHED ACCURACY

in direct flow indication

Wherever you seek simplicity and high accuracy in flow measurement at lowest cost, the Meriam "H" Meter is the well-known answer.



Here is an easy-to-install flowmeter . . . free of all conventional service requirements . . . giving long-term economy as well as low initial cost. There are no pressure tight bearings . . . no magnetic followers . . . no stuffing boxes . . . no hysteresis problems whatsoever. No calibration is ever required, yet you have the highest accuracy available.

★ High operating pressures
★ High pressure differentials
★ All steel construction
★ Heavy duty glass enclosure
★ Built-in protection against line surges

Write for Bulletin 18A

Meriam Manometer Instrumentation
...for pressures, vacuums, flows, liquid levels.

meriam
INSTRUMENT COMPANY
10920 Madison Ave. • Cleveland 2, Ohio

WE HEAR THAT

Continued

▸ *BATAVIA-KRITZER, INC.* has completed negotiations for the purchase of the plant, machinery, tools and inventory of the heating division of *UNION ASBESTOS & RUBBER CO.*

▸ The office of the Detroit technical section of *INTERNATIONAL NICKEL CO., INC.'s* development and research division is now located at 19842 James Couzens Hgwy., Detroit 35.

▸ *KENNARD CORP.* has started construction on a new manufacturing plant in the St. Louis area. About double the size of the present facility, the new plant will be completely air conditioned.

▸ *EXCELSIOR STEEL FURNACE CO.* has moved its general offices to new and larger quarters at 546 W. Washington Blvd., Chicago 6.

▸ *SELLERS INJECTOR CORP.* has acquired the complete line of injectors formerly manufactured by *OHIO INJECTOR CO.* The move is part of Sellers' overall expansion program designed to broaden its injector lines, the company reports.

▸ *MAMMOTH FURNACE CO.* announces the opening of a new, enlarged plant and home office at 6425 Cambridge St., Minneapolis 16.

▸ As a move to separate Chicago sales and service activity from the company's general office, *McDONNELL & MILLER, INC.* has relocated its Chicago district sales office to 5875 N. Lincoln Ave. in that city.

▸ *UNITED STATES TESTING CO.* has installed in its main laboratories at Hoboken, N. J., a vertical duct apparatus for determining the performance of air filters. The test procedure is that of the Air Filter Institute code for testing air cleaning devices used in general ventilation.

Check these features

- Micrometer torque seating switch gives tight valve closure, and protects valve parts from damage.
- Self contained unit—no gears, stem nut or bearings to buy.
- Weatherproof, dust-tight, watertight and explosion-proof construction.
- Hammerblow device . . allows motor to reach full speed, before load is engaged.
- Non-rotating handwheel built into the unit.
- Automatic declutching.
- Motor is disengaged during handwheel operation.
- Can always be declutched for handwheel operation regardless of weather or electrical conditions.
- High torque motors.
- Simple valve yoke.
- May be mounted in any position.
- Three to four times faster handwheel operation.
- Actuation may be by any available power source such as electricity, air, oil, gas, water or steam. LimiTorque is readily adapted for microwave control.
- LimiTorque is designed for plug, butterfly, gate and globe valves up to 96" diameter . . . Entire Unit and nut can be lifted off valve yoke, by removing flange bolts.

Send for Catalog L-550 and see why this and other types of LimiTorque Valve Operators are so widely used.

LimiTorque®

PHILADELPHIA GEAR WORKS, INC.
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.
Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS
LIMITORQUE VALVE CONTROLS
FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia

News about

B.F.Goodrich Chemical *raw materials*

Piping that won't corrode; carries oil, acids, chemicals . . . **made from Geon rigid vinyl**

GEON rigid vinyl is an exceptional material used by leading producers of pipe and fittings to provide cost-cutting installations.

Geon-made piping is immune to galvanic corrosion, eliminating the major source of failure in underground lines. It has superior resistance to oil, acids, alkalis, and most chemicals . . . including attack by sour crude oil, salt water and corrosive fumes.

The smooth interior surface of Geon vinyl pipe reduces frictional head loss, and inhibits the buildup of deposits . . . adding years of maintenance free life. You'll find the light weight and simple assembly of rigid vinyl piping provide important savings in freight, time, and labor.

For a new booklet on specific properties of Geon materials for rigid vinyl piping, write Dept. DN-4, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

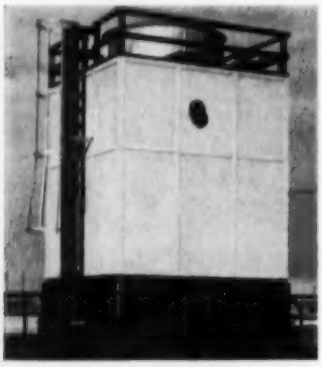
B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

The Phillips Transite Cooling Towers have been in operation over nine years and proven to furnish the required cooling with lowest possible maintenance cost. Phillips Towers are available with framing of California Redwood or Hot Dipped Galvanized Steel as preferred.

The new Phillips nailless fill adds to simplicity of erection and maintenance.

The Phillips eliminator system guarantees minimum drift loss.

When you have a cooling problem call your Phillips representative.



Phillips Cooling Tower Co., Inc.
220 DUPONT ST., BROOKLYN 22, N. Y.

WE HEAR THAT

Continued

▸ *VAPOR HEATING CORP.* has purchased *ROTH RUBBER CO.*, manufacturer of molded mechanical rubber products. Roth Rubber stockholders received eight shares of Vapor common stock in exchange for each share of Roth Rubber stock. *JAMES A. KNIGHT* will continue to be in charge of Roth's operations as vice president and treasurer of the division.

▸ Contracts have been signed forming the *GRISCOM-RUSSELL-SCHACK CO., INC.*, it was announced jointly by *K. B. RIS*, president of *GRISCOM-RUSSELL CO.*, and *DR. A. SCHACK*, president of *SCHACK REKUPERATOR CO.*, Dusseldorf, Germany. The new company will manufacture and market Schack metallic shell and tube heat exchangers.

▸ *STANLEY H. LANGER*, *CHARLES ZAHN* and *IRVING WENDER*, all of U.S. Bureau of Mines, were recipients of the *BITUMINOUS COAL RESEARCH, INC.*, award for the best paper pertaining to coal at the 1956 spring meeting of the *AMERICAN CHEMICAL SOCIETY*, held recently at Dallas.

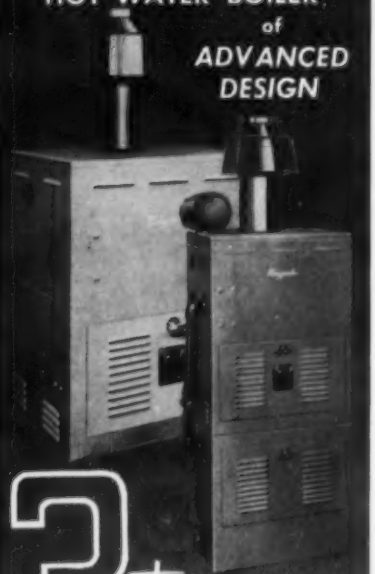
▸ *JOSEPH T. RYERSON & SON, INC.* has purchased property in Indianapolis as the site for a new steel service plant. The new facility, to be located on a 14 acre tract and to cost approximately $1 million, is planned to be in operation early in 1957.

▸ Founded in 1856 as Bayley & Greenslade, Blacksmiths & Iron Goods Manufacturers, *BAYLEY BLOWER CO.* is marking its 100th anniversary this year.

▸ The *WATER CONDITIONING RESEARCH COUNCIL* has moved its offices from Chicago to Wheaton, Ill. The council's research laboratories remain in New York City.

Raypak

Extended Surface, copper tube, gas fired
HOT WATER BOILER
of
ADVANCED DESIGN



3 times the BTU's per pound of weight
YET FAR STRONGER

Specifically designed for baseboard radiation and radiant panel heating, swimming pools and air conditioning systems. All heating models feature Raypak Gas Modulation, swimming pool models feature self-generating electrical system.

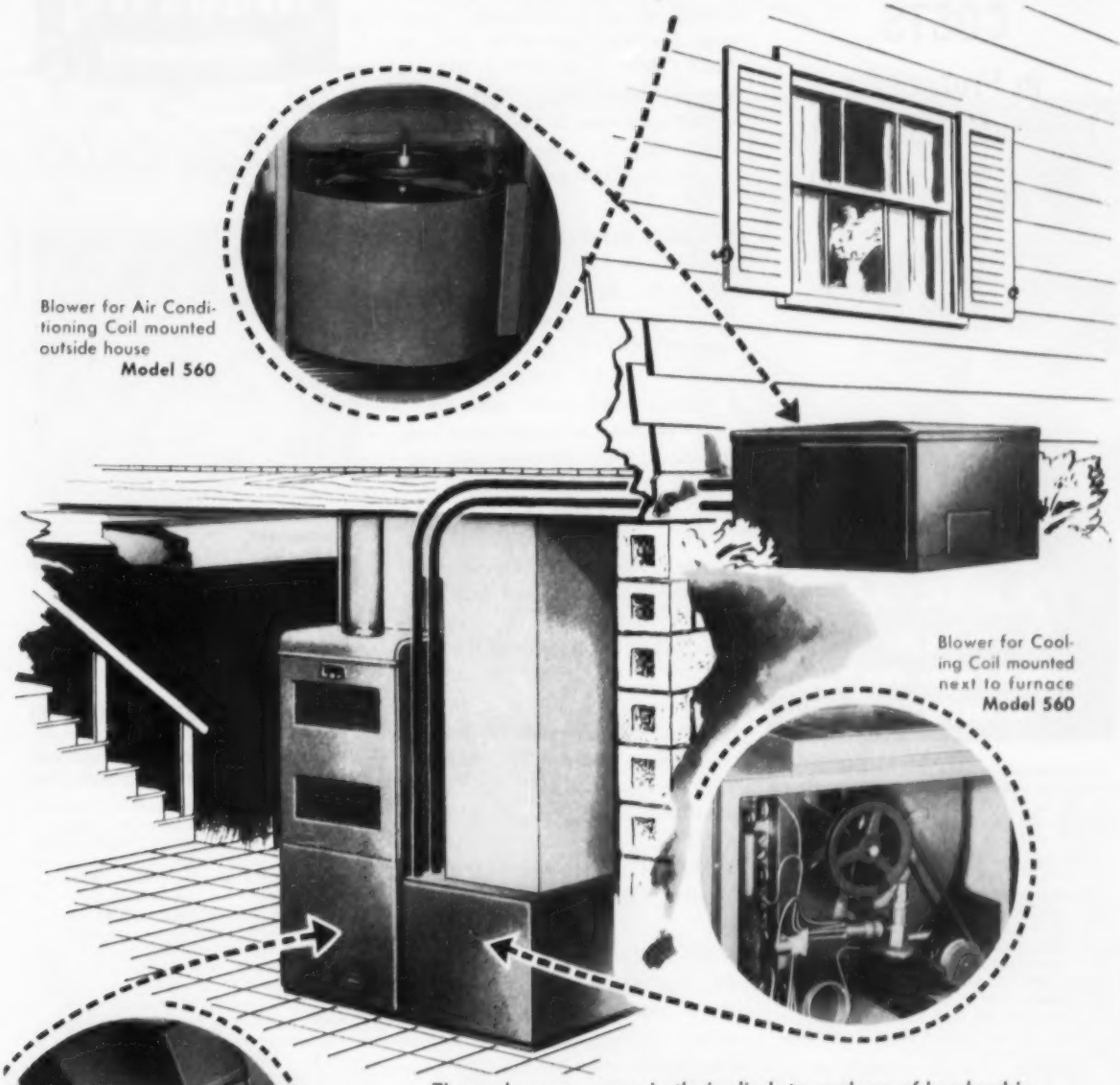
Specify Raypak, the originators of the "Plug-In", package Boiler.

Throughout the country Raypak Company selects specialized and skilled representatives to handle sales and help solve your Boiler problems.

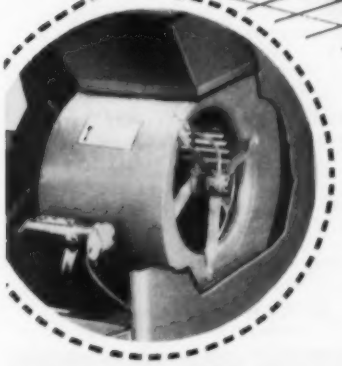
Raypak
RAYPAK COMPANY, INC.
Engineers-Manufacturers
2416 Chico Ave El Monte, California

OPERATION: *Air Movement*

Blower for Air Conditioning Coil mounted outside house
Model 560



Blower for Cooling Coil mounted next to furnace
Model 560



Blower for Heating System
Model 319

Through many years in their climb to a place of leadership in the Heating . . . and now, the Air Conditioning field . . . it has been a rich experience for MORRISON PRODUCTS INC. to work with BRYANT in the development of their equipment.

To build the finest Air Conditioning products . . . to chart air movement in the most effective, efficient way for the greatest health and comfort of mankind . . . this is an accomplished goal that is giving real meaning to their slogan "GROW BIGGER WITH BRYANT"

MORRISON PRODUCTS INC.
16816 WATERLOO ROAD • CLEVELAND 10, OHIO

HOW TO CUT APPLICATION COSTS

in Protecting Pipe and Pipe Joints Against Corrosion

Let TAPECOAT® do the job without Kettles, Hot Stuff, or Special Crews

When specifications call for hot applied coal tar protection of underground piping as in AWWA specifications C-203 and C-204, and the volume does not justify the cost of shipment to a mill for coating—TAPECOAT offers a practical solution. Here is a widely-accepted alternate material that is equivalent to mill-applied hot coal tar protection.

With this coal tar coating in handy tape form, piping contractors can use their own personnel to do the job because technical know-how and special equipment are not required. You save time and money and eliminate the need for sub-contracting in assuring the long-life protection called for.

TAPECOAT is easy to apply, using a torch to soften and bleed the pitch which provides both bond and protection. Available in widths of 2", 3", 4", 6", 18" and 24", it is spirally wrapped or cigarette wrapped around the vulnerable surfaces.

Since 1941, TAPECOAT has proved its ability to fight corrosion on pipe, pipe joints, mechanical couplings, conduit, cable and insulated piping.

Write for illustrated brochure.

The TAPECOAT® Company

Originators of Coal Tar Coating in Tape Form

1555 Lyons Street
Evanston, Illinois

WE HEAR THAT

Continued

▸ What is reported to be the first West Coast facilities for the manufacture of air conditioning equipment has been opened by *DAY & NIGHT DIV., CARRIER CORP.*, at Monrovia, Calif. The new plant consists of more than 20,000 sq ft and is said to have an annual capacity for more than 30,000 units.

▸ Work is underway on a new plant at Oklahoma City for *GOVERNAIR CORP.* The new facility will double current manufacturing capacity, say company officials.

▸ Awards in connection with control of air pollution were conferred upon *WARD F. DAVIDSON* and *DR. EDWARD R. WEIDLEIN* by the *AIR POLLUTION CONTROL ASSOCIATION* at its 49th international meeting, held recently. Mr. Davidson and Dr. Weidlein are retired from Consolidated Edison Co. of New York and Mellon Institute, respectively.

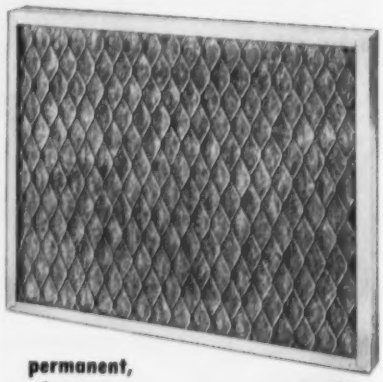
▸ Top prize winners of *CARRIER CORP.'s* "Weathermaker" dealer contest were awarded $10,000 apiece. Winners were: *CARL E. THAIN*, McAllister, Okla.; *L. J. L'HEUREUX*, Ft. Pierce, Fla.; *SIDNEY B. MOTEL*, Chicago; and *TED KIRK*, Marshall Creek, Pa.

▸ *JOHN WOOD CO.* has purchased the Fluid Heat Div. of *ANCHOR POST PRODUCTS, INC.* The transaction, involving upward of $1 million, covers the machinery, equipment and inventory in Baltimore and also the plant site and buildings, machinery and inventory at Red Oak, Iowa.

▸ Designed for the mass production of precision machined valve bodies, a new transfer machine has been installed by *MANNING, MAXWELL & MOORE* at its Watertown, Mass., plant. At a cost of over $250,000, the machine is said to employ many of the principles of automation for the first time in the valve industry.

designed to Industry requirements

Alum-O-Aire



permanent, dry-type

Copper UL AIR FILTER

engineered to industry specifications for all corrosive atmospheres

Here's the filter that solves the problem of air-cleaning in installations involving corrosive fumes, dusts or vapors. Pure COPPER wool media catches and holds *all* the dirt — and the media does *ALL* the filtering. No oils or adhesives required. Never rusts or corrodes. No fire hazard. Saves time; saves money!

All-metal *lifetime* construction with copper-plated mat retainers and aluminized steel frames for added strength and lightweight. Washes in a jiffy in water or solvents for immediate re-use. Outlasts ordinary filters as much as 10 to 1 — eliminates replacement costs; cuts maintenance expense. Approved by Underwriters' Laboratories.

standard and 'HIGH-VELOCITY' types for every air-cleaning application

Available in ½", 1" and 2" sizes for any filter installation, *A-LUM-O-AIRE* Filters can be engineered to exact specifications for special applications. Also furnished with *aluminum-wool* media for non-corrosive recirculated air applications.

world's largest manufacturers aluminum and copper wool

Carey Electronic Engineering Co.
METAL WOOL DIVISION
(Dept H-5)
1880 Clifton Avenue Springfield, Ohio

AGAIN!

SIL-FOS brazed tubing gets the call...

HERE'S MORE PROOF of the steadily growing swing to silver brazing of non-ferrous tubing systems with the low-temperature silver brazing alloy SIL-FOS.

Hot and cold water lines in the recently opened New York Coliseum are SIL-FOS brazed. More and more buildings are going to SIL-FOS brazed non-ferrous tubing every day because you just can't argue with advantages like these . . . *tremendous savings in weight and cost of light-weight tubing over pipe . . . big savings in assembly time and labor through elimination of threading . . . the fact that a SIL-FOS brazed installation is permanently leak-tight and maintenance-free.*

Above—Section of SIL-FOS brazed 6" copper line with water meter, valves and bronze fittings in basement.

EVERY ARCHITECT AND CONTRACTOR should have SIL-FOS facts. There's a trained SIL-FOS Distributor near you ready to supply full information. Write today for our "Distributor List". With it we'll send SIL-FOS literature.

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General Offices: 82 Fulton St., New York 38, N. Y.

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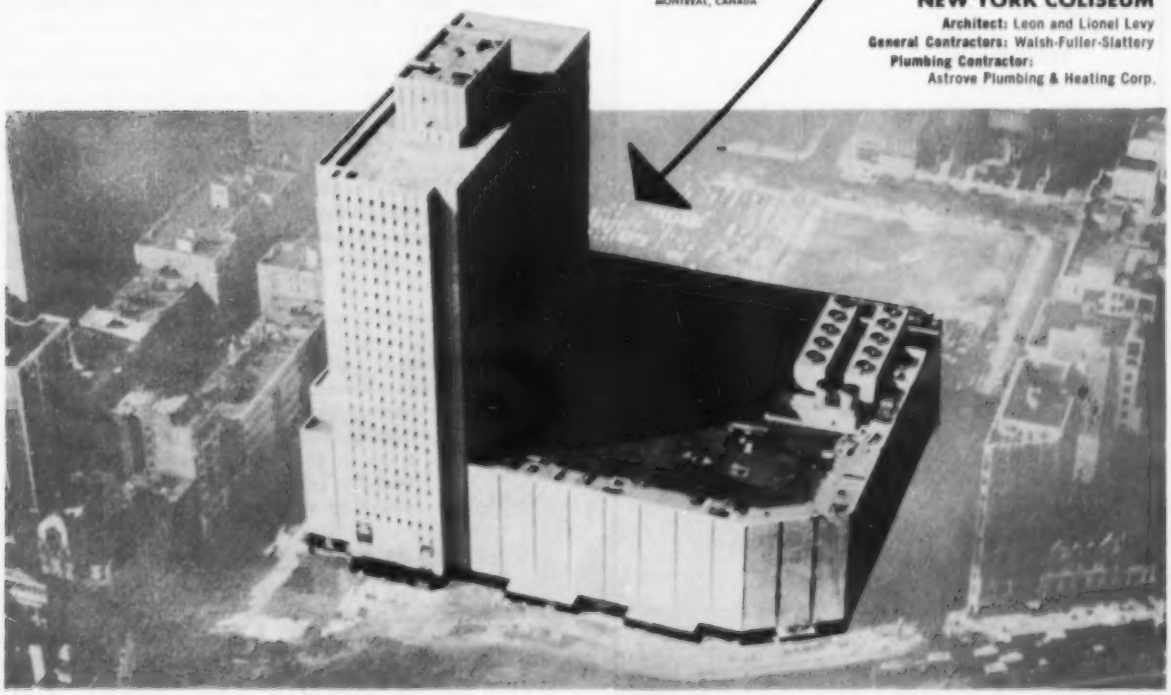
DETROIT, MICH.
LOS ANGELES, CALIF.
TORONTO, CANADA
MONTREAL, CANADA

NEW YORK COLISEUM

Architect: Leon and Lionel Levy
General Contractors: Walsh-Fuller-Slattery
Plumbing Contractor: Astrove Plumbing & Heating Corp.



Random Thoughts from a Filter Engineer

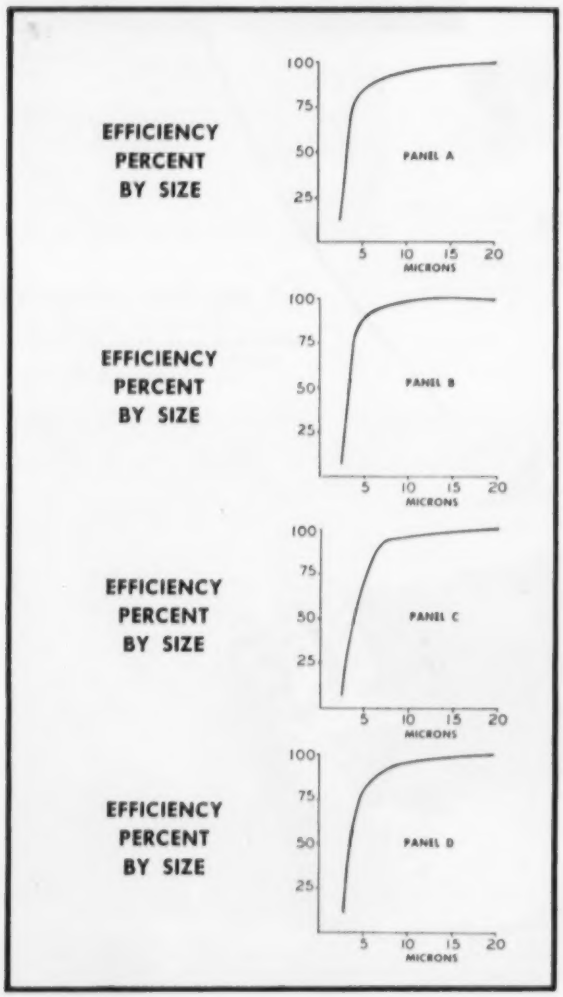
by A. F. Siers, Sales Engineer

- **AIR FILTER EFFICIENCY GRAPHS CAN BE CONFUSING**
- **THE CASE OF THE DISGRUNTLED BANK PRESIDENT**

AIR FILTER EFFICIENCY GRAPHS CAN BE CONFUSING . . . EVEN TO ENGINEERS

Every once in a while, we lose a filter order because a competitor has come up with a new method of presenting performance figures.

Take particle size analysis, for example. We have never believed that a viscous impingement filter was indicated for small particle removal. To satisfy ourselves and some of our customers, we decided to check a few different filters on this basis.



The graphs tell the story well. We selected four different filter panels—three of them competitive units. Each was subjected to the same carefully controlled conditions. Same adhesive application, same dust, same rate of feed, same air flow, same test method. Samples of the effluent air were taken on Millipore samplers and the contaminant microscopically analyzed.

The results show that while a particle size determination may be useful in evaluating generic *types* of filters, it has little value in comparing one filter with another.

To date, we've found no better way to give you filter test data than the procedure adopted by the Air Filter Institute. If all filter manufacturers adopt this test method, much of the confusion now existent in test data would be eliminated.

THE CASE OF THE DISGRUNTLED BANK PRESIDENT

The who-dunnit detectives have nothing on us. We're frequently called in to solve filtration mysteries baffling as any the "private-eyes" work on. What we call the "Case of the Disgruntled Bank President" is a good example.

A certain bank recently installed one of our Electromaze electronic filters. They insisted on the most efficient air filtration. The Electromaze filled the bill because it removes dirt particles down to 1/50 of a micron. Imagine the dark thoughts that passed through the bank president's mind when one fine morning, he found his desk covered with a fine layer of dust. You're right, telephone wires hummed. Within the hour our men were going over the installation with a fine tooth comb. The electronic tubes were in tôp shape, the ionizing wires fine—in fact the entire installation was in apple-pie order. Finally we found the culprit. One of the bank's maintenance men had switched off the current in the mistaken belief that he could save himself some work!

Of course this is a more whimsical case than the run-of-the-mill air filtration problems we're called upon to solve. We think though it illustrates one important advantage of Air-Maze equipment . . . sure, fast service, the unseen part of our products. Service like this is as near as your telephone. Trained representatives in 83 cities are ready to give you friendly, competent help . . . whenever and wherever you need it.

AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE
The Filter Engineers
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

WE HEAR THAT

Continued

▸ The Cleveland office of *ROBERTSHAW-FULTON CONTROLS CO.* has been moved to new larger quarters at 6116 St. Clair Ave.

▸ The downtown business district of Evansville became a showcase for products of *SERVEL, INC.* during the city's recent observance of "Servel Week." The week-long program was sponsored by Evansville's Downtown Retail Merchants Association.

▸ About 350 office employees of *LEWYT CORP.* reported to new offices in Long Island City, N.Y., as the corporation began consolidation of its three companies in a recently purchased six-story building there. The job of moving the three Brooklyn facilities will be completed sometime in the fall.

▸ Completion and opening of its new iron and steel plant, part of a multi-million dollar program of consolidation and expansion of all manufacturing operations at its Fairmount site, has been announced by *LUNKENHEIMER CO.* The modern, two-story structure adds more than 100,000 sq ft of floor space to the company's production facilities there.

▸ Three National Safety Council awards for outstanding performance in reduction of lost-time accidents and two more from Liberty Mutual Insurance Co. for long periods of continuous performance without disabling injuries have been presented to *CARRIER CORP.*

▸ Completion of *WORTHINGTON CORP.'s* mechanical power transmission warehousing expansion program has been revealed by company officials. The program, which has been under expansion for over a year, is designed to keep mechanical power transmission stocks flowing smoothly from the factory at Oil City, Pa., to strategic distribution points in the nation.

▸ The western district sales office of *E. I. DU PONT DE NEMOURS & CO.'s* "Kinetic" Chemicals Div. has been moved to Palo Alto, Calif. Previously located in Menlo Park, Calif., the new facilities will serve customers in the 11 state area west of the Rockies.

▸ To house its expanding research activities, *TAYLOR INSTRUMENT COMPANIES* has leased a laboratory building on the former Prince St. campus of the University of Rochester. Taylor plans to refurbish the four-story building to provide space for laboratories and lecture rooms. One floor will be devoted to technical training.

20 YEARS AGO

Therm-O-Tile

REG. U.S. PAT. OFF.

UNDERGROUND PIPE CONDUIT

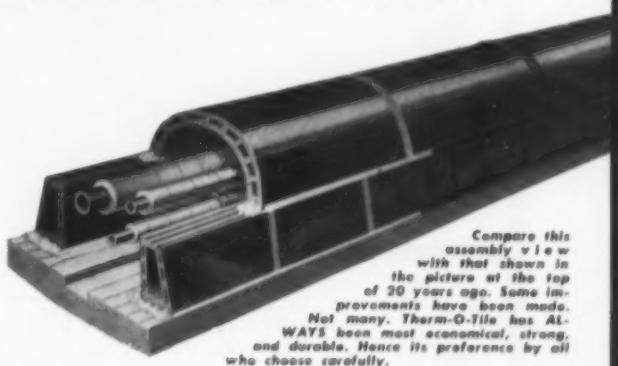
The picture at the top appeared in the June 1936 issue of HEATING, PIPING & AIR CONDITIONING. At that time we were not aware of its importance ourselves for it was the

First Federal Housing Project and Therm-O-Tile Underground Pipe Conduit was Specified.

During these twenty years Therm-O-Tile has been specified for many more Federal and other Housing Projects, all over the United States, requiring many miles of Therm-O-Tile. 6,000 feet was used in the FIRST project, at Atlanta, Ga., to supply heat to 700 families.

Ask for Advice. Our engineers, specialists in underground conduit design, will gladly work with you without obligation to develop the best and most economical installation for your purpose.

Bulletin 10154. This bulletin, recently published, gives all of the important data concerning Therm-O-Tile. Ask for a copy.



Compare this assembly view with that shown in the picture at the top of 20 years ago. Some improvements have been made. Not many. Therm-O-Tile has ALWAYS been most economical, strong, and durable. Hence its preference by all who choose carefully.

H. W. PORTER & CO., INC.

822-H Frelinghuysen Avenue • Newark 5, N. J.

REID HAYDEN, INC.

BALTIMORE, MD. RICHMOND, VA. CHARLOTTE, N. C.

Insulation Engineers & Contractors

WE HEAR THAT

Continued

▸ "Wheelerweld" is the new name of the Weldment Div. of *C. H. WHEELER MFG. CO.* Wheelerweld Div. was, until recently, known as the Cruse-Kemper Div.

▸ *HASTINGS INSTRUMENT CO., INC.* and *RAYDIST NAVIGATION CORP.* have consolidated to become *HASTINGS-RAYDIST, INC.*, Hampton, Va. Management and personnel remain the same.

▸ *COOPER ALLOY CORP.* is expanding its facilities at its Hillside and Clark Township, N.J., plants. Construction of new buildings has already begun with the completion of the Hillside addition scheduled for this summer and Clark early fall. The overall cost is estimated at $500,000.

▸ Plans for a new, enlarged warehouse in Cincinnati have been announced by *C. G. HUSSEY & CO., DIV. OF COPPER RANGE CO.* The necessity for larger sales and service facilities is attributed to the growth of the copper and brass consuming industries in the Cincinnati-Dayton-Louisville area.

▸ At the request of *OIL-HEAT INSTITUTE OF AMERICA, INC.*, a two-year commercial-industrial oil burner course is being held at Springfield Trade High School, Springfield, Mass. The course operates as a day school on a post high school level. The school announces that facilities are available for enrolling 40 students each year.

▸ *ROLLED STEEL PRODUCTS DIV., EMERGENCY STEEL SERVICE CORP.* has acquired property on Chicago's northern outskirts as a site for the construction of a 50,000 sq ft warehouse. Work is underway on the $550,000 project.

▸ *BORG-WARNER CORP.* plans to spend approximately $25 million for expansion of its facilities this year. This brings to about $157 million the funds the corporation has paid out for these purposes since the end of World War II.

▸ A section of wrought iron pipe with a service life of more than 37 years was highlighted in a durability contest sponsored by *A. M. BYERS CO.* at this year's *NATIONAL ASSOCIATION OF CORROSION ENGINEERS* show in New York. Top prize was given for the closest guess to the service life of the pipe section.

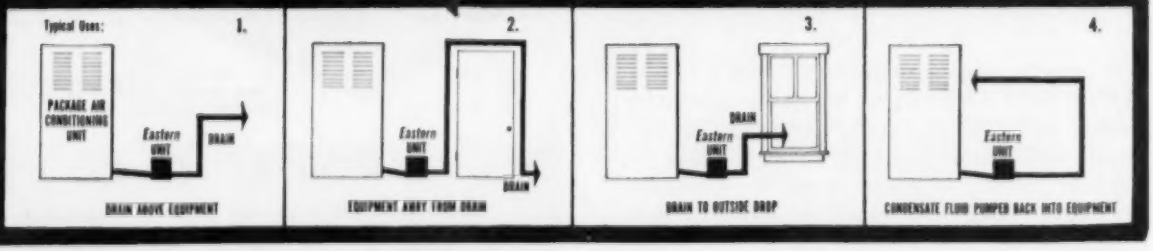
REMOVE CONDENSATE WATER

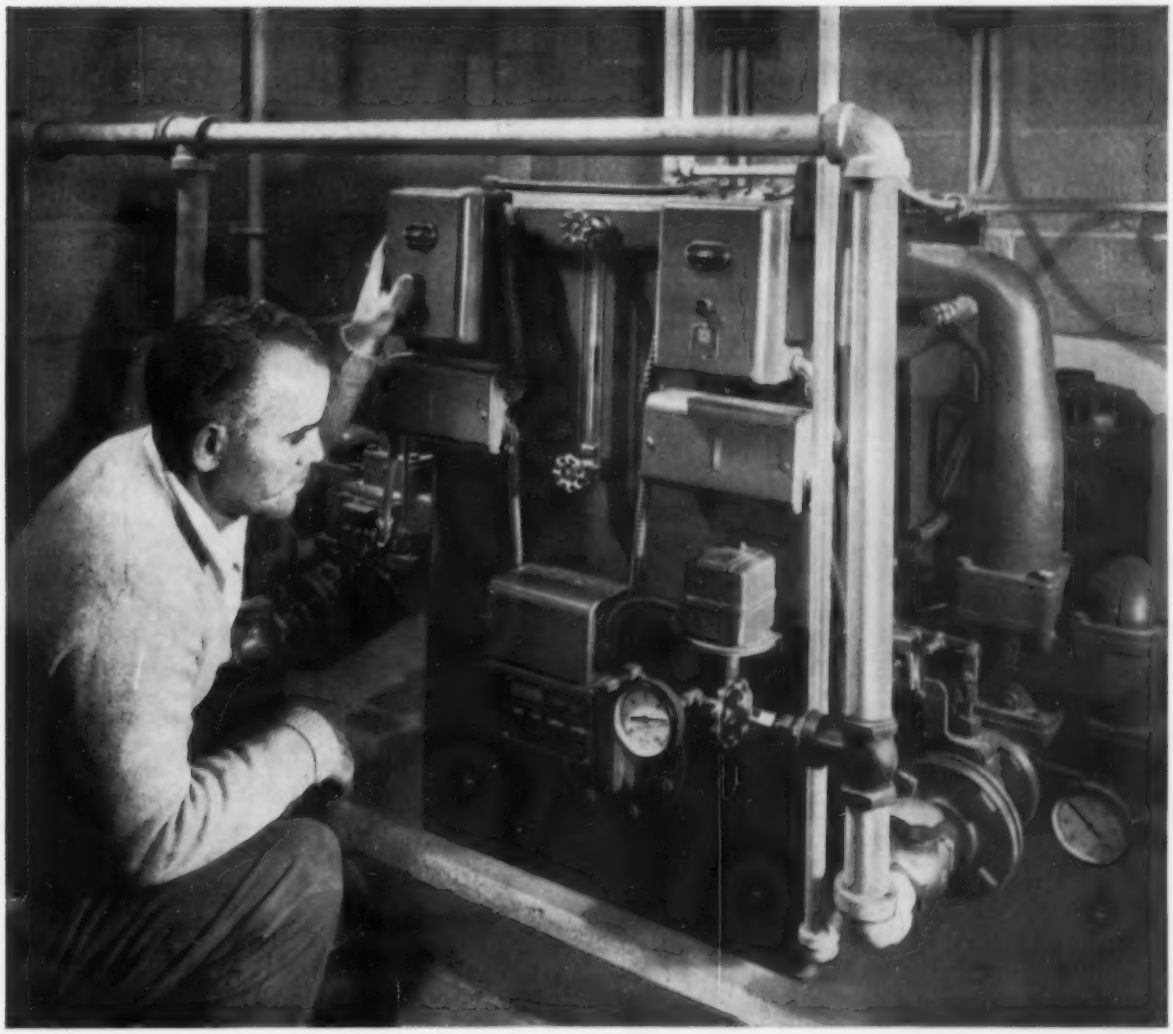
FROM AIR CONDITIONING SYSTEMS

A completely automatic, foolproof unit designed to remove hot or cold condensate fluids from the receiver tank and pump it to an outside drain. Simple to install with air conditioning equipment, it gives quiet and reliable performance.

Eastern Model 3, Type 100:
Tank capacity 0.8 gallon. Centrifugal pump delivery approximately 4½ GPM at 0 P.S.I. and shut off of 12½ P.S.I. Motor 1/40 H.P., 115 volt. Weight 23 pounds. Mercury control switch. Size 5⅛ inches wide, 10 inches long, 11¾ inches high.

EASTERN INDUSTRIES, INCORPORATED
100 SKIFF STREET, HAMDEN, CONN.





This pump puts maintenance men on the shelf

The maintenance man who depends on repairing Dunham Vacuum Heating Pumps for his living . . . can quit right now. There's nothing for him to do.

Dunham Code Rated Pumps just don't *require* extensive maintenance—even after 15-20 years of continuous service producing high vacuum (26 in., if required) at low amperage. Here's why:

Dunham Pumps need no close clearance adjustment to maintain capacity . . . no extra-high air capacities to compensate for lower efficiency due to pump wear.

Dunham Pumps have *only one* principal moving part.

Dunham Pumps need *only one* motor for removal of *both* air and condensate.

Dunham Pumps have no vacuum on pump stuffing box.

Dunham Pumps are code rated—your assurance of more than adequate air capacity, without overrating to compensate for leaky systems.

Dunham Pumps have heavy-gauge copper bearing steel tanks for maximum resistance to corrosion.

Single and duplex models in capacities from 2500 through 65,000 EDR. For full information, mail coupon.

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RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

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Slot STRIPLINE DIFFUSERS by AGIATA® Slot
Type S
STRIPLINE combines the best features of both slots and efficient
air diffusers to provide equalized air flow throughout its entire length.
STRIPLINE slot diffusers are slenderly designed, inconspicuous, practical and versatile.
These slot diffusers can be located in walls, ceilings, coves, moulds, window reveals
and stools or almost anywhere to suit interior design.
Type H
Write for complete Stripline Catalog.
AIR DEVICES INC. • 185 MADISON AVENUE • NEW YORK 16, N. Y. • AIR DIFFUSERS • FILTERS • EXHAUSTERS

WE HEAR THAT

Continued

▸ *VERTICAL TURBINE PUMP ASSOCIATION* held its second tri-annual meeting of 1956 in Kansas City, Kan., June 4-5. Members of the association placed particular emphasis on a review of vertical pump engineering developments and progress. *H. H. BENJES* of *BLACK & VEATCH CO.*, consulting engineers, spoke on Vertical Pump Applications in Water Works Practices.

▸ A centennial exhibition held recently by the Dubuque wholesale branch of *A. Y. McDONALD MFG. CO.* was enthusiastically received by dealers, suppliers and the general public. The exhibition was in commemoration of McDonald's 100th year of business.

▸ Standards for cooling towers for power, process and air conditioning systems were requested of the *AMERICAN STANDARDS ASSOCIATION* recently, at a general conference of manufacturers and users of the towers. The conference voted unanimously to set up standards according to the procedures of ASA.

▸ *AIRTEMP DIV., CHRYSLER CORP.'s* 63,000 sq ft plant addition at Dayton has been completed. The new building, part of a $2,000,000 expansion program, will enable Airtemp to triple its production of mobile aircraft air conditioners, according to the company.

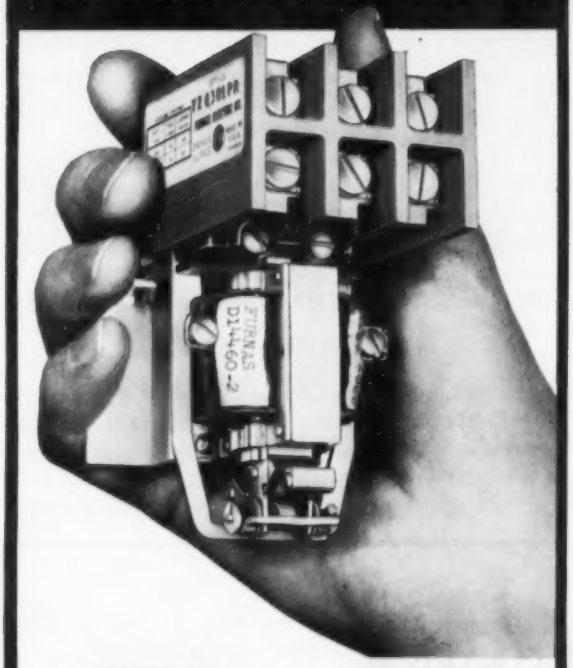
▸ Scholarships for mechanical engineering study at four selected colleges have been announced by the *CARRIER FOUNDATION, INC.* The schools are Cornell University, University of Kentucky, Georgia Institute of Technology and Rensselaer Polytechnic Institute. Four scholarships will be awarded annually to deserving high school graduates who require financial assistance.

▸ With the formation of an instrument division, *FISCHER & PORTER CO.* has completed its divisional decentralization program. The company is now divided into five product division. *DONALD J. TRICEBOCK*, formerly assistant to the sales manager, will head the new division.

▸ *FREEMAN STOKER DIV., ILLINOIS IRON & BOLT CO.* has purchased the stoker business of *COMBUSTIONEER DIV., STEEL PRODUCTS ENGINEERING CO.* All of the equipment and parts on hand as well as all the tools, dies, patterns, etc., for production are being transferred to the Illinois Iron & Bolt plant at Carpentersville, Ill.

FURNAS ELECTRIC CONTROLS

do the best job for AIR CONDITIONING and REFRIGERATION



NEW—4 SIZES

For the first time, an ampere size to match your single and polyphase starter requirements for current rated motors through 550 volts. Now you can choose from 20-30-35-50 ampere sizes. Look for these features: 1—Each pole carries full current—no poles connected in parallel. 2—Silver Cadmium Oxide contacts—longer life. 3—Magnets require less watts thereby reducing transformer sizes and thermostat contact load—savings in cost and space.

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FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

Sales Representatives in all Principal Cities

ON THE *Booming Florida Scene*

DRAYER-HANSON AIR CONDITIONING

MORE

Seville Hotel, Miami Beach. Architect: Melvin Grossman/Air Conditioning Engineer: Sam L. Hamilton.

AND MORE

Hollywood Beach Hotel, Hollywood Fla. Architect: Melvin Grossman/Engineers: Sassnett Engineering.

AND MORE

Belle Isle Apartments, Miami Beach. Architect: Robert B. Swartburg/ Engineers: Altec Engineering Co.

AND MORE

Lucerne Hotel, Miami Beach. Architect: Carles B. Schoeppl/Engineers: Altec Engineering Co.

A sure sign of the times in Florida—"Air Conditioning by Drayer-Hanson"! . . . in a wide variety of installations: the new Biscayne Shopping Plaza, La Gorce Country Club, Miami Sheriff's Station, El Sirocco Motor Hotel, many more. Marked advantages to meet any requirements with D-H Flexazone systems! Spotaire systems! HH and HHV systems!

Request catalogs

drayer-hanson

3301 Medford Street • Los Angeles 63, California
(Division of National - U.S. Radiator Corporation)

WE HEAR THAT

Continued

▸ *PEROLIN CO., INC.* has relocated its executive offices and headquarters for its eastern industrial, marine and export divisions to the Empire State Bldg., New York.

▸ *ALLEGHENY LUDLUM STEEL CORP.* and *MIDVALE-HEPPENSTALL CO.* have completed an agreement for the sale by Allegheny Ludlum of technical knowledge and patent rights for the production of consumable electrode vacuum remelting of steel and ferrous group base alloys. Under terms of the agreement, Allegheny Ludlum is furnishing its know-how in consumable electrode vacuum remelting, furnace design, and production.

▸ *STURTEVANT DIV., WESTINGHOUSE ELECTRIC CORP.* has been given an award of honor by the National Safety Council for its excellent safety record during 1955.

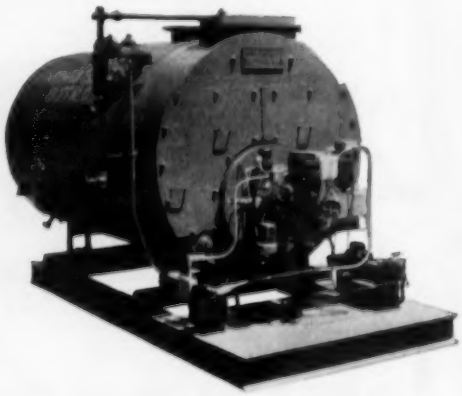
▸ *WHEELING CORRUGATING CO.* has leased a new warehouse location for its Kansas City branch in North Kansas City, Mo. The one-story structure has an area of 85,000 sq ft.

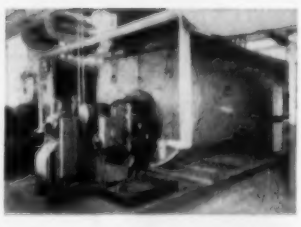
▸ "The use of general purpose industrial controls will double within the next eight to 10 years," according to *W. F. OSWALT*, general manager of *GENERAL ELECTRIC CO.'s* general purpose control department. He spoke at the department's first official open house to be held since the new multi-million dollar plant at Bloomington, Ill., opened.

▸ *HOOKER ELECTROCHEMICAL CO.* plans to build a three-story addition at its "Durez" North Tonawanda, N.Y., plant for use as a product application laboratory. The new extension will connect with the present control laboratories and will measure 50 × 120 ft.

▸ Over 75 engineering and service department men employed by dealers in all parts of the United States attended the *IRON FIREMAN MFG. CO.* factory engineering training school held in Cleveland recently. The school is held annually by the company.

▸ *DELCO APPLIANCE DIV., GENERAL MOTORS CORP.* has inaugurated a new series of dealer service instruction meetings. The meetings are held at training centers throughout the country.





Two BISON Super Scot Low-Pressure Boilers at Sylvania Electric Products, Inc., Batavia, N. Y. Engineers and General Contractors, Siegfried Construction Co., Inc., Buffalo, N. Y.; Heating Contractors, Joseph Davis, Inc., Buffalo, N. Y.

BISON

SUPER SCOT BOILERS

for packaged heating units

To the best in the century-old Scotch Boiler with its tried-and-true two-pass design, BISON Super Scot Low-Pressure Boilers offer a number of advantages made possible by their exclusive features.

Per unit of heating surface, Super Scot Boilers are bigger. They have a larger furnace, more steam space and water content. The area directly exposed to the radiant heat of combustion is a greater percentage of the total heating surface. Certified ratings are moderate but extra loads can be handled with larger burners.

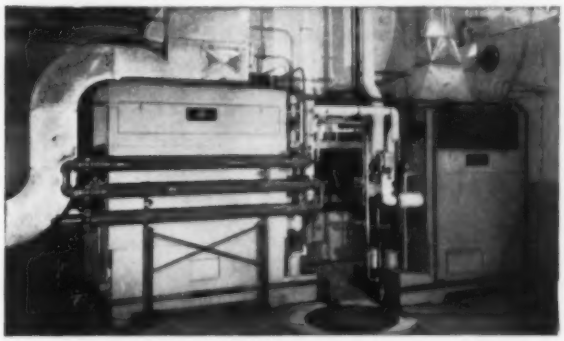
Results—smokeless combustion, extra capacity for peak loads, lower maintenance, longer life and less cost of steam generated.

Consult F & T also for high-pressure boilers.

FARRAR & TREFTS DIVISION
ADSCO INDUSTRIES, INC.
20 MILBURN ST. BUFFALO 12, N. Y.

This NEW METHOD DRIES AIR

PRECISELY AS YOU WANT IT



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

For complete information write

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. HP. 405 Lexington Ave. New York 17, N. Y.

Sales Engineers in Principal Cities of U. S. and Canada

Since 1925 The Webster Engineering Company has devoted its entire efforts to the designing, manufacturing and the applying of modern burner and automatic control equipment.

Webster
Burners & Controls

Webster Burners are practically standard equipment with numerous large utilities and every industry where gas and oil are used as fuels.

Webster's facilities permit it to recommend the equipment required to produce the desired results at a reasonable cost. Webster units are not loaded with gadgets.

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Webster's engineers are ready to prepare specifications for any type or size gas and/or oil burning installation.

Webster equipment is marketed through ◎JANITROL district offices and many other exclusive agents.

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WEBSTER ENGINEERING
Company

TULSA 1, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

OVER 400 BURNERS REPLACED WITH THIS FUEL SAVER

LO-BLAST ECONOMITE

POWER GAS CONVERSION BURNER

In the small home development of 472 homes in Marquette Heights, near Peoria, Illinois, illustrated above, Lo-BLAST Economite Power Gas Burners replaced oil burners originally installed. The reasons are evident when the trouble-free performance and economy of the Economite are considered.

Power burner design assures perfect combustion, regardless of natural draft conditions—*saves an average of 10% in fuel*—ideal for down-draft heating plants. The Economite burns so smoothly you can't tell when it's running.

Every Economite is factory-tested on gas and shipped assembled, fully equipped with fool-proof safetys.

Lo-BLAST Power Gas Burners are available in capacities from 70,000 to 20,000,000 BTU input. Write for literature.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

WE HEAR THAT

Continued

▸ *PENNSYLVANIA SALT MFG. CO.* has announced expansion of chlor-caustic facilities at its Calvert City, Ky., works as part of its $55 million growth program.

▸ *AIRTEMP DIV., CHRYSLER CORP.* has sent four packaged air conditioners to Rome to be used for the air conditioning of a "typical American supermarket," which is being erected there under the auspices of the National Association of Food Chains.

▸ "The Shape of Things," a new color and sound movie on the casting and forging plant of *ALLEGHENY LUDLUM STEEL CORP.* has been released for showing. The company announces its availability for showing to organized groups.

▸ *BABCOCK & WILCOX CO.'s* nuclear facilities plant near Lynchburg, Va., has begun production. The plant is said to be the first major facility in the nation erected entirely at private expense to manufacture and test nuclear fuel elements and related products for peacetime use.

▸ *CRANE CO.* has held a series of two-day meetings designed at helping salesmen to better serve the small commercial heating field. More than 340 salesmen from 57 branches attended, the company reports.

▸ *DR. O. L. BARNEBEY*, president of *BARNEBEY-CHENEY CO.*, has returned from a four-month round-the-world trip with reports of rapidly increasing interest in air purification. "Everywhere I went, local engineers and professional men expressed a great interest in complete air conditioning," Dr. Barnebey said.

▸ *PENNSYLVANIA SALT MFG. CO.* has completed the Dyer's Hill fluorspar mine in Crittenden County, Ky. The development of this mine and the expansion of milling facilities in the same area began early in 1954.

▸ *WHEELING CORRUGATING CO.'s* new half-million dollar warehouse and office building in Minneapolis has been officially opened. The warehouse was designed to provide more adequate facilities to meet the demand for the company's products.

▸ *JOSEPH T. RYERSON & SON, INC.* announces that its division of industrial engineering will hereafter be known as the plant engineering division. Its division of standards and methods has been renamed the operating controls division.

☆ ☆ ☆

Manufacturers' Agents

Are you interested in securing additional lines?

We are occasionally asked by our manufacturer advertisers to suggest the names of manufacturers' agents in various sections of the country whom they can contact in regard to representation of their industrial and large building heating, piping, and air conditioning products.

If you would like your name listed on our records for inquiries we may receive on your territory, we invite you to write us. There is no charge in connection with this service.

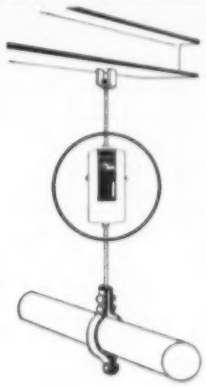
Heating, Piping & Air Conditioning

6 NORTH MICHIGAN AVENUE
CHICAGO 2 ILLINOIS

☆ ☆ ☆

"WITCH"

PIPE HANGERS
FOR
HEATING – PLUMBING
POWER & PROCESS



- Rugged
- Compact
- Simple in design and installation
- Indispensable for systems operating at changing temperatures

FIG. 401
SPRING HANGER

Our catalogue illustrates a complete line of Pipe Hangers & Supports and is an indispensable reference book for engineers, contractors, estimators & erectors. Write for your copy now.

MAINTAINING OFFICES AND WAREHOUSES ACROSS THE NATION

CARPENTER and PATERSON, Inc.
18 HURLEY ST., CAMBRIDGE, MASS.

WE HEAR THAT

Continued

▸ *EUTECTIC WELDING ALLOYS CORP.'s* more than 350 district engineers are now providing a new advisory service which will establish the additional savings an industry can achieve through increased use of advanced welding procedures, the company reports.

▸ *ST. REGIS PAPER CO.* announces that it is more than doubling the capacity at its recently acquired subsidiary, *CHESTER PACKAGING PRODUCTS CORP.* and its affiliates, *CHESLAM CORP.* and *CHESFLEX CORP.* As a step to improve service in the South, wholesalers can now draw from Chesflex' Birmingham and Dallas warehouses.

▸ The first of several schools conducted by *CARRIER CORP.* designed to provide information for gas utility sales engineers on large gas powered air conditioning systems was held recently at Syracuse.

▸ New York executive offices of *KAISER ENGINEERS* have been moved to 300 Park Ave. Traffic and expediting offices have relocated to 620 Fifth Ave., in that city.

▸ The spring tour of *PENN CONTROLS, INC.'s* "Controlorama" drew record attendance, the company reports. The show has just ended a 23-city tour through the East and Northeast.

▸ *SQUARE D CO.* has announced plans to construct an electrical equipment assembly plant in Atlanta as the base of expanded operations in the Southeast. Involving an investment of $500,000 and designed to permit future additions, the 31,000 sq ft structure will house the company's regional headquarters offices as well as provide production facilities.

▸ *WILLIAM WALLACE CO.* has established a new warehouse in Los Angeles "to provide improved service and faster deliveries to its increasing number of southern California customers." The new warehouse, located at 5160 Alhambra Ave., also houses the company's district office, which was formerly located in Glendale.

▸ *FAIRBANKS, MORSE & CO.* will move its electronics division from Davenport, Ia., to East Moline, Ill. According to the company, the move has become necessary because of the division's expanding sales and the need for greater manufacturing space. ‡

Shhhhh . . .

COMPLETE *SILENCE*
FOR YOUR ENTIRE
PIPING SYSTEM
WITH A

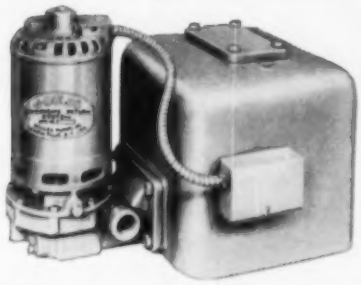
MILLER *STREAMFLOW* CHECK VALVE

CENTER GUIDED • SHOCK PROOF • ELIMINATES WATER HAMMER
ENTIRELY *NOISELESS* • FULL RADIAL FLOW
Certified Minimum Pressure Loss Curves Available • Sizes 1" through 24"
Flanged • ASA Drilling • IBBM • Cast Steel • All Alloys

Visit our Booth 1118 International Amphitheater, Chicago, Illinois International Exposition February 25 — March 1, 1957

WRITE FOR LATEST CATALOG
AGENTS IN PRINCIPAL CITIES
MILLER VALVE CO. INC.
P.O. BOX 1255 — PITTSBURGH 30, PA.
PLANT — 1620 PENNSYLANIA AVE.

NEW CONDENSATE RETURN SYSTEMS



7-, 14-gal. capacity. 2,000 to 10,000 sq. ft. radiation.

40-, 60-, 100-gal. capacity. 15,000 to 75,000 sq. ft. radiation.

Why steam systems use less fuel and last longer with new Goulds Condensate Returns

Save fuel. You can circulate condensate faster with one of these new condensate returns. The condensate retains much of its heat, spends less time in the boiler before turning into steam again.

The boiler feed unit automatically blends make-up water with hot condensate. Feeding such a uniformly hot blend to the boiler keeps the boiler fire running at an even level.

Save wear on your system. Both units minimize the amount of make-up water needed to keep the system working. Their action reduces scale formation and corrosion in the system.

So you get a longer-lasting, as well as a more efficient system.

Units automatically controlled by float switches on receivers or water level control on boiler, require only infrequent maintenance.

Receivers: Cast iron on the 7- and 14-gal. sizes; heavy gauge welded sheet steel on the 40-, 60-, and 100-gal. sizes.

Pumps: Bronze-fitted to prevent corrosion. Close-coupled, centrifugal. Duplex units are available.

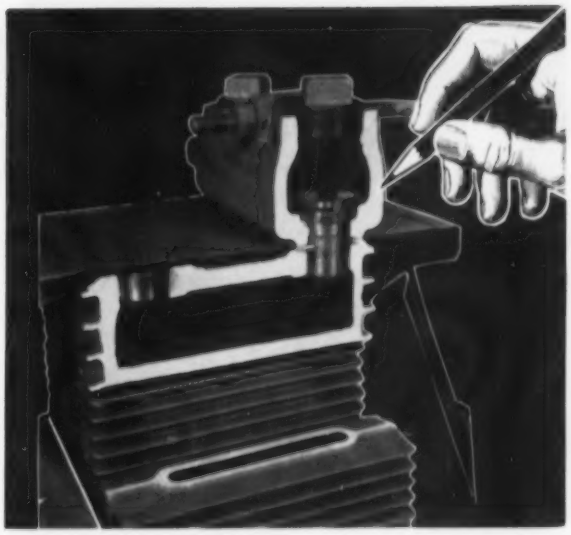
Motors: ¼ to 5 HP; 3500 RPM; stainless steel shafts.

Write for Bulletin 660A1 for details on both units.

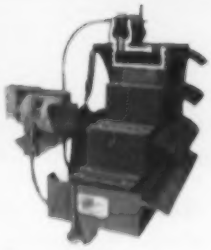
MEMBER HYDRAULIC INSTITUTE

Goulds PUMPS INC. Seneca Falls New York

Sales Offices: Atlanta • Boston • Chicago • Houston • New York • Philadelphia • Pittsburgh • Tulsa



GRID



CAST IRON CONSTRUCTION ends your UNIT HEATER maintenance problems!

Corrosion in unit heaters—external, from contaminated air . . . internal, from electrolytic action ends—when your unit heaters are GRID cast iron construction. Here's why—GRID heating sections are made of high-test cast iron . . . *no external corrosion from acid or other fumes present in many plants.*

All metals in contact with steam are similar . . . no electrolytic action internally . . . *no internal corrosion.*

GRID construction ends your unit heater maintenance problems—because GRID will operate on steam pressures up to 250 lbs. P.S.I. . . 450° temperature . . . no pressure-reducing valves needed. No soldered, brazed, welded or expanded connections . . . a specially designed threaded nipple provides a leak proof joint (see illustration).

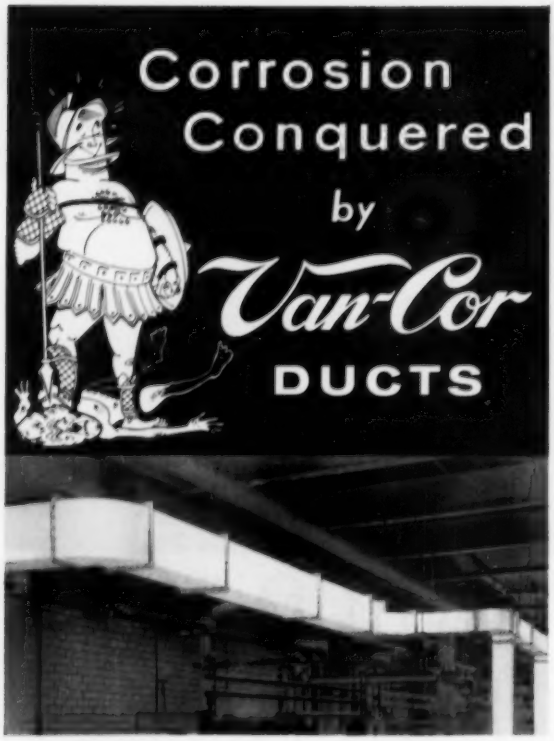
GRID design gives you maximum heating performance because—GRID provides more air changes at lower outlet temperatures . . . carefully selected motor speeds and fan capacities positively deliver warm, comfortable air in ample volume to floor level . . . no wasted heat through stratification.

GRID installations save you money as GRID requires no maintenance . . . is practically self-cleaning (note wide fin spacing in illustration). GRID provides long service life. . . units installed in 1929 are still operating. No ordinary unit heater approaches GRID'S record for continuous trouble-free heating service.

Get the complete story on GRID Unit Heaters, GRID Blast Heaters and GRID Radiation for industrial plant use. Write for your copy today!

D. J. MURRAY MANUFACTURING CO.

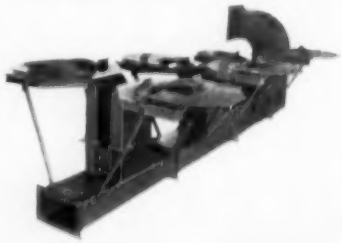
Manufacturers Since 1883 • WAUSAU, WISCONSIN



OLD METHOD—To exhaust fumes from their plating department, a bearing manufacturer used metal coated ducts. Corrosion destroyed them in eight months.

NEW METHOD—Van-Cor Ducts shown above have already served three years—*four times longer*—and are as good as new!

An unplasticized polyvinyl chloride, Van-Cor has licked scores of corrosion problems. Van-Cor is fabricated into ducts, hoods, chemical tanks, stacks, etc. Also available in pipe, fittings and valves. Both Chemically Resistant and Impact Resistant types. Van-Cor has only half the weight of aluminum, yet has high tensile strength.



Intricate Van-Cor hood and duct for exhausting acid fumes while reclaiming precious metals. Previous duct materials were replaced every two months. This Van-Cor fabrication is over two years old.

INVESTIGATE!

Write for Bulletin, Specifications and Name of Nearest Distributor.

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COLONIAL PLASTICS MFG. CO.

SUBSIDIARY OF THE VAN DORN IRON WORKS CO.
2685 EAST 79th STREET • CLEVELAND 4, OHIO

MEETINGS & CONVENTIONS

SEPT. 10-12—*The American Society of Mechanical Engineers,* fall meeting. Denver ASME headquarters: 29 W. 39th St., New York 18.

SEPT. 17-21—*11th Annual Instrument-Automation Conference and Exhibit.* Coliseum, Columbia University, and Hotels Statler and New Yorker, New York. Sponsored by Instrument Society of America. Exhibit office: 250 W. 57th St., New York 19.

SEPT. 24-28—*Trade Fair of the Atomic Industry.* Navy Pier, Chicago. Conference headquarters, Morrison Hotel, Chicago. Information: Dan Scherer, Atomic Industrial Forum, Inc., 260 Madison Ave., New York 16.

SEPT. 25-27—*Third Annual Forum Conference,* "Management and Technology for the Atomic Industry." Morrison Hotel, Chicago. Information: D. J. Scherer, Atomic Industry Forum, 260 Madison Ave., New York 16.

OCT. 1-3—*Mechanical Contractors Association of America,* fall board of directors meeting and secretaries' conference. Hotel Statler, Detroit. Headquarters: Room 210, Shoreham Bldg., Washington 5, D. C.

OCT. 1-3—*National Electronics Conference,* 12th annual meeting. Hotel Sherman, Chicago. Information: Victor J. Danilov, Illinois Institute of Technology, Chicago 16.

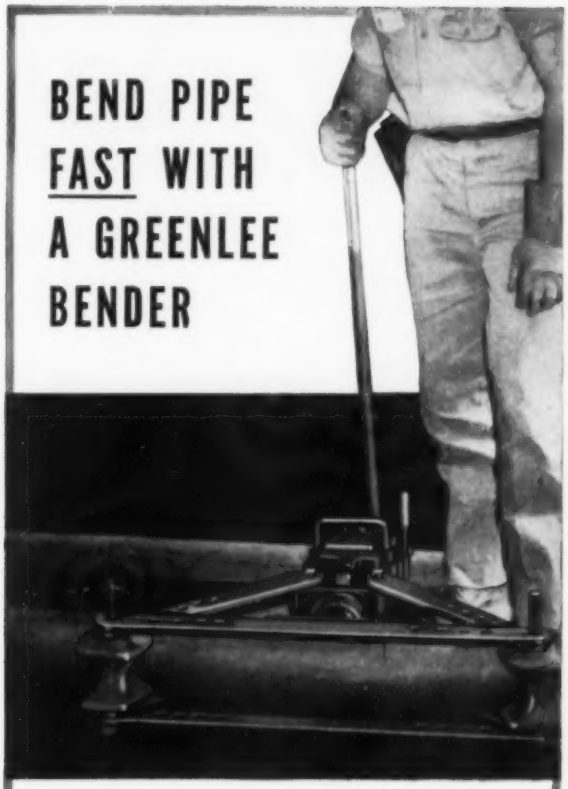
OCT. 1-5—*National Association of Corrosion Engineers,* south central regional meeting. San Antonio. NACE headquarters: 1061 M&M Bldg., Houston 2, Texas.

OCT. 8-12—*American Welding Society,* fall technical meeting. Hotel Cleveland, Cleveland. Headquarters: 33 W. 39th St., New York 18.

OCT. 15-17—*American Gas Association,* annual convention. Atlantic City. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 15-17—*National Association of Corrosion Engineers,* northeast regional meeting. Drake Hotel, Philadelphia. NACE headquarters: 1061 M&M Bldg., Houston 2.

BEND PIPE FAST WITH A GREENLEE BENDER



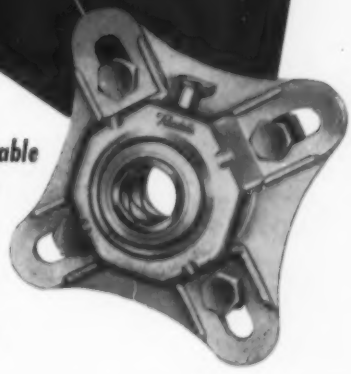
Built for the tough jobs, the GREENLEE Hydraulic Bender saves hours, cuts costs on your piping work . . . smoothly bends *all sizes of pipe up to 5"*. With the GREENLEE, *one man* quickly makes accurate bends "right on the job" exactly where and when needed! Many owners report labor savings of 50% and more . . . and the cost of many manufactured bends and fittings is eliminated. Compact, portable, versatile . . . use the same power unit with radius attachments for making radiant heating return bends. Two models. Portable power pump also available to put your bending on a fast "production line" basis. Reduce costs, speed jobs with the GREENLEE Bender, which often pays for itself on the very first job. Get facts today.

TUBING BENDERS Swiftly produce accurate small-radius bends in tubing and pipe. No flattening or kinks. Especially designed to form neat bends to fit sharp corners and nooks and other close quarters. Various sizes and models for pipe, steel, copper, brass and aluminum tubing.

TOOLS FOR CRAFTSMEN
GREENLEE

Greenlee timesaving tools for plumbing and heating work: Hydraulic Pipe Pushers • Hydraulic Pipe Benders • Tubing Benders • Pipe Bits Auger Bits • Spiral Screw Drivers • Chisels • And many more Greenlee Tool Co., 2347 Twelfth Street, Rockford, Illinois

* NEW Randall LOW COST 4-BOLT FLANGE UNIT



- *Easily Interchangeable*
- *Double Lubricated*
- *Self-Aligning*
- *Self-Lubricating*
- *Easy to Install*
- *Long Trouble-Free Service*

Randall's new 4-bolt flange is readily interchangeable with any unit having bolt hole centers from 2⅛" to 2¼". It's ideal for heavy duty application on farm implements, conveyors, textile machinery, air moving equipment, packaging machinery and other similar type equipment.

*

This new, low-cost, four-bolt flange pillow block has all the outstanding features synonymous with Randall bearings. It features the famous, exclusive Randall "deep well"® ball assembly which offers a unique double lubricating principle combining Randall's exclusive graphited bearings with grease or oil type lubricants. This assures controlled lubrication for long trouble-free operation.

Compact and light weight, the Randall 4-bolt flange is designed with slotted bolt holes which permit fast assembly and easy interchangeability. Units are shipped assembled as one piece to assure easy handling and installation. Complete information is yours for the asking — Write today!

BRONZE BAR STOCK
BRONZE BUSHINGS
PILLOW BLOCKS
SHEET LUBRICATOR
GRAPHITED BEARINGS
THRUST WASHERS
SAFETY COLLARS
BRONZE CASTING

Randall

RANDALL GRAPHITE BEARINGS, INC.

1012 S. Greenlawn Ave., Lima, Ohio

MEETINGS & CONVENTIONS — *Continued*

OCT. 22-24—*American Standards Association*, 38th annual meeting in conjunction with Seventh National Conference on Standards. Hotel Roosevelt, New York, N.Y. Headquarters: 70 E. 45th St., New York, N.Y.

OCT. 22-26—*44th National Safety Congress & Exposition*. Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 23-26—*National Association of Corrosion Engineers*, south central regional meeting. Gunter Hotel, San Antonio. NACE headquarters: 1061 M&M Bldg., Houston 2.

OCT. 24-27—*Air-Conditioning and Refrigeration Wholesalers*, annual meeting. Jung Hotel, New Orleans. Headquarters: 2607 N. High St., Columbus, Ohio.

OCT. 29-*NOV.* 2—*National Association of Practical Refrigerating Engineers, Inc.*, annual convention. Statler Hotel, Detroit. Headquarters: 435 N. Waller Ave., Chicago 44.

NOV. 15-16—*National Association of Corrosion Engineers*, north central regional meeting. Hotel Statler, Detroit. NACE headquarters: 1061 M&M Bldg., Houston 2.

NOV. 15-18—*Refrigeration Service Engineers Society*, annual convention. Hotel Muehlbach, Kansas City, Mo. Headquarters: 433 N. Waller Ave., Chicago.

NOV. 25-28—*American Society of Refrigerating Engineers*, semi-annual meeting. Boston. Information: ASRE, 234 Fifth Ave., New York 1.

NOV. 25-30—*American Society of Mechanical Engineers*, annual meeting. Statler Hotel, New York. ASME headquarters: 29 W. 39th St., New York 1.

NOV. 26-28—*Refrigeration and Air Conditioning Contractors Association*, annual convention. Balmoral Hotel, Miami Beach. RACCA headquarters: 10660 Carnegie Avenue, Cleveland 6.

NOV. 26-30—22*nd National Exposition of Power and Mechanical Engineering*. Coliseum, New York. Under auspices of American Society of Mechanical Engineers. Manager: E. K. Stevens, care of the Exposition, 480 Lexington Ave., New York 17.

New compactness in air-cooled AIR CONDITIONER design!

Smallest air-cooled, self-contained (not remote) 5-ton central type unit made.

5 natural wood-grain finishes available on all free-standing models.

Completely automatic, thermostat controlled, air-cooled condenser.

MODEL RO-525A
(with air distribution head)

MODEL NO.	NOMINAL CAPACITY	TOTAL COOL. B.T.U.	COOLING C.F.M.	OUTSIDE DIM.
FL-2	2 Ton	24,000	900 @ .3 S.P.	30Wx21Dx43H
RO-26	2 Ton	24,000	1000 @ .3 S.P.	30Wx21Dx34H
RO-31	3 Ton	36,000	1200 @ .2 S.P.	30Wx23Dx38H
RO-31 H.P.	3 Ton	37,700	1400 @ .3 S.P.	30Wx25Dx40H
RO-525 A	5 Ton	65,500	1800-2400 @ .3 S.P.	40Wx26Dx57H

Thermostat has 3 positions: Continuous — Automatic, Fan & Compressor — OFF.

Complete air conditioning for entire home — or equivalent commercial or office area — at the lowest cost in smallest space! GENERAL AIR CONDITIONERS deliver 2, 3 or 5 tons of cooling. All models operate on standard outlet (220 V, single and 3 phase except 2-ton — single phase only).

Attic, roof, outside, or free-standing units

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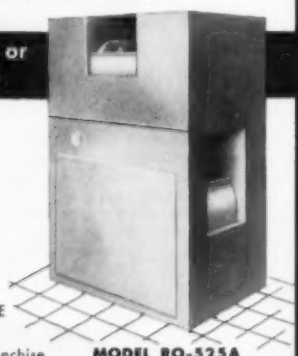
WRITE today for details. Franchise dealerships available.



MODEL RO-525A
(without air distribution head)

Main Office
GENERAL AIR CONDITIONING CORP.
Dept. S-25 • 4542 E. Dunham St.
Los Angeles 23, California

FIVE YEAR GUARANTEE — easy payment plan

For Beauty In Buildings . . .

What makes one building interior stand out over others? In many cases it's that extra touch of splendor given by Hendrick Grilles. There are over one hundred different Hendrick Grilles available to harmonize with the most modern designs for residential, business or public buildings . . . many are exclusive Hendrick designs. Each design can be furnished in a wide range of overall dimensions, bar sizes and number of perforations. And they're easy to install because they always lay flat . . . don't bend or warp. Write for complete details.

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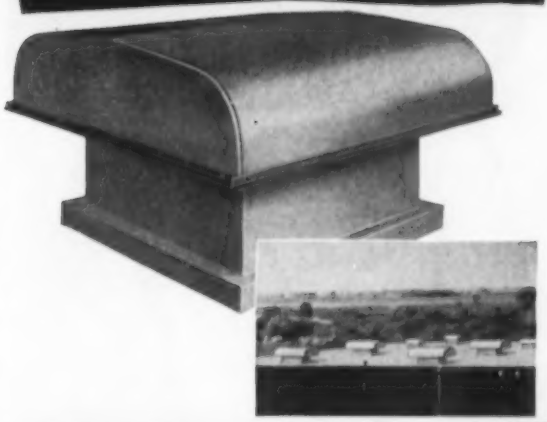
Perforated Metal • Perforated Metal Screens • Wedge-Slot and Hendrick Wedge Wire Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids • Hendrick Hydro-Dehazer

Low silhouette...



High ventilating efficiency

. . . Swartwout *Low-Line* Roof Ventilator ties in with modern building trend

Adaptable to many situations where individual roof ventilators serve best, the Low-Line simplifies your selection. For Low-Line is made in both gravity flow and powered types. Roof appearance can be standardized; gravity Low-Lines for use over areas where positive pressure exists — powered style where heat or fumes need forced removal. And where positive intake of fresh air is desired, Low-Line can be arranged for that purpose at our factory. In all three styles the design of this modern ventilator assures top efficiency.

The nicely proportioned hood provides generous capacity — combines neat, business-like appearance with high utility. Made in 11 sizes, with many capacity variations available in powered style. Write for Swartwout Low-Line catalog sections.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

AUTRONIC PROCESS CONTROL EQUIPMENT

CARNES recommends Alnor VELOMETER for instant Air Flow readings

Like all major manufacturers of air diffusers, Carnes Manufacturing Corporation recommends the use of an Alnor Velometer when balancing an installation of its air diffusers, such as the Model EJ shown being tested above.

Carnes knows that you can measure *actual* air delivery—precisely and quickly—with the Alnor Velometer. Such accuracy assures design performance of every installation.

The Velometer is the only instantaneous, direct reading air velocity meter—accurate in all ranges, from high to low...compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

Take the recommendation of every major manufacturer of air diffusers—get an Alnor Velometer. You'll save time and money on the next installation you balance.

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Room 513, 420 No. LaSalle St.
Chicago 10, Ill.

☐ Please send Velometer Bulletin 2448-G

Name.....

Company.....

Address.....

City.....Zone....State.....

Alnor PRECISION INSTRUMENTS FOR EVERY INDUSTRY

MEETINGS & CONVENTIONS *Continued*

NOV. 26-30—*Third International Automation Exposition.* Trade Show Bldg., New York. Management: Richard Rimbach Assoc., Inc., 845 Ridge Ave., Pittsburgh 12.

NOV. 27-30—*National Warm Air Heating and Air Conditioning Association,* committee meetings and annual convention. Netherland Plaza, Cincinnati. NWAHACA headquarters, 640 Engineers Bldg., Cleveland.

NOV. 27-30—*Ninth National Chemical Exposition.* Public Auditorium, Cleveland. Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1.

1957

JAN. 28-31—*Eighth National Plant Maintenance & Engineering Show.* Public Auditorium, Cleveland. Information: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

FEB. 25-*MAR.* 1—*International Heating & Air-Conditioning Exposition.* International Amphitheater, Chicago. Under auspices of American Society of Heating and Air-Conditioning Engineers, in conjunction with its 63rd annual meeting, also at Chicago. Exposition management: International Exposition Co., 480 Lexington Ave., New York 17. ASHAE headquarters: 62 Worth St., New York 13.

MAR. 11-15—*National Association of Corrosion Engineers.* Kiel Auditorium, St. Louis. NACE headquarters: 1061 M&M Bldg., Houston 2.

APR. 14-27—*United States World Trade Fair.* Coliseum, New York. Information: United States World Trade Fair, 331 Madison Avenue, New York 17.

MAY 6-8—*Air-Conditioning and Refrigeration Institute,* annual meeting. The Homestead, Hot Springs, Va. ARI headquarters: 1346 Connecticut Ave., N.W., Washington 6, D.C.

MAY 7-10—*Mechanical Contractors Association of America,* annual meeting. Hotel Fontainebleau, Miami Beach. The association is at 30 Rockefeller Plaza, New York 20.

JUNE 2-5—*American Society of Refrigerating Engineers,* annual meeting. Hotel Fontainebleau, Miami Beach. ASRE headquarters: 234 Fifth Ave., New York.

??? WHY... ???

Combi-Matic

Forced Draft GAS OIL Burners

Here are THREE IMPORTANT REASONS...

(and there are more)

Underwriters' Laboratories listed

FGO Series... GAS-OIL BURNER—6 models in capacity to 3,500,000 BTU input.

1. POWER combi-matic offers the most complete line and advanced design for light oils and gases.
2. Now! controlled combustion on both gas and oil... with higher efficiency and lower operating costs.
3. Positive and complete *safety* with a *pre-purge* period in standard operating cycle.

MORE SALES FOR YOU... BECAUSE THERE ARE MORE ADVANTAGES FOR YOUR CUSTOMERS:

- Factory "FIRE-TESTING" insures... "on the job" performance.
- Automatic air adjustment... lets you set it—forget it.
- Electronic safeguard... responds immediately to flame interruption.
- Pressure safety control... prevents opening of either fuel valve unless air for combustion is proven.
- Optional automatic or manual changeover...
- GAS ELECTRIC IGNITION... is automatic on BOTH fuels.

SOMETHING EVERY DEALER WANTS:

- Less installation time.
- Standard parts and controls always and immediately accessible...

Power combi-matic Gas-Oil burners are but one important part of a complete line of burners.

FG Series—Power gun type burners—ideal for all conversion applications... particularly oil burner replacement.

BFG Series—Heavy duty Power-Flame burners—large capacities for heating, power or processing.

A Power-Flame Dealership can be valuable; write today for complete information

Power-Flame BURNER

A Division of

Siemon Manufacturing Company • Grandview, Mo.

put **Extra-Profits** *in your pocket* **with**

"engineer-approved"

ELGEN All-Tite VANE RUNNERS NOW IN COILS!

THE EASIEST AND QUICKEST WAY EVER DEVISED
for installing single or double blade turning vanes in square elbows. No special tools required.

New production machinery of our own exclusive design, now enables us to produce button type Elgen All-Tite vane runners in continuous coils, effecting a savings in *your cost per job.*

COILED ELGEN ALL-TITE VANE RUNNERS MEANS . . .

- *Less Waste!* Waste pieces due to short ends are a thing of the past. Vane runner metal is coiled in 100 foot lengths, you just pull out the exact footage needed.
- *Easier Storage!* Each coil weighs approximately 50 lbs. and is packed in a box 28" x 28" x 5". Box fits easily under bench or against wall.
- *Easier Handling!* No loose pieces lying around to get in the way or collect dirt.
- *Unrolls absolutely flat!* Vane runner metal emerges from the box at bench height . . . absolutely flat . . . ready for use.

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ELGEN SILENT DUCT . . . for forming "flexible" duct connectors. A one piece metal to material unit, packed in coils, unrolls absolutely flat. Makes on the spot work a cinch.

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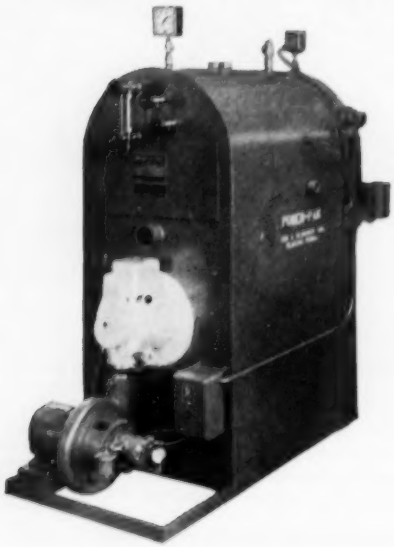

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MEETINGS & CONVENTIONS *Continued*

1957

JUNE 16-21—*American Society for Testing Materials.* Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 24-27—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Murray Bay, Quebec. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

OCT. 7-9—*American Gas Association*, annual convention. Kiel Auditorium, St. Louis. AGA headquarters: 420 Lexington Ave., New York 17.

NOV. 14-16—*American Society of Refrigerating Engineers*, semi-annual meeting. Morrison Hotel, Chicago. ASRE headquarters: 234 Fifth Ave., New York.

NOV. 18-21—*10th Exposition of the Air-Conditioning and Refrigeration Industry.* Navy Pier, Chicago. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D.C. ⫩

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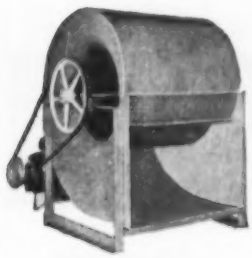

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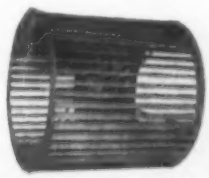

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NEW BOOKS & REPORTS...

1956 Blue Book of Air Conditioning—66 pp. 4¼ × 7¼ in. Illustrates, lists specifications for room air conditioners produced by various manufacturers. National Appliance Trade-In Guide Co., 2132 Fordem Ave., Madison 1, Wis. $5.00.

Diffusion of Hydrogen Through Ceramic Coatings, summary technical report 2000—By J. R. Cuthill and R. W. Dixon. National Bureau of Standards, U.S. Department of Commerce, Washington 25, D. C.

1956 Room and Window Air Conditioner Specifications—Refrigerating Engineering, 234 Fifth Avenue, New York 1. 1-9, 25c each; 10-24, 20c each; 25-99, 15c each; 100-499, 10c each; 500-999, 5c each; over 1000, 4c each.

American Standard Scheme for the Identification of Piping Systems—ASA A13.1-1956. Revised Ed. American Society of Mechanical Engineers, 29 W. 39th St., New York 18. $1.00.

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Recommended for heating heavy fuel oils to facilitate withdrawal from large storage tanks. Since only the oil within heater is heated, the need for heating entire tank is eliminated and heating costs lowered.

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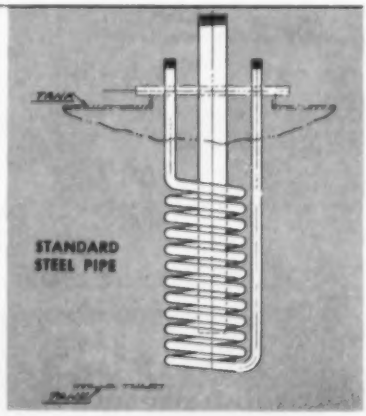

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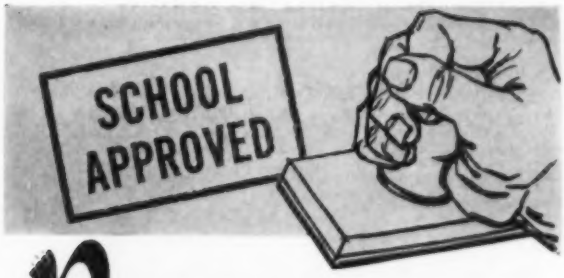

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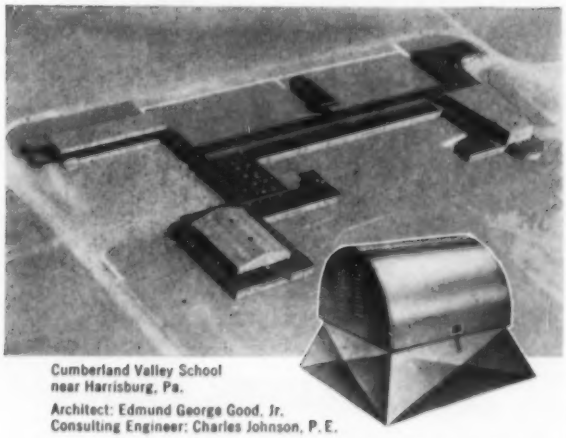

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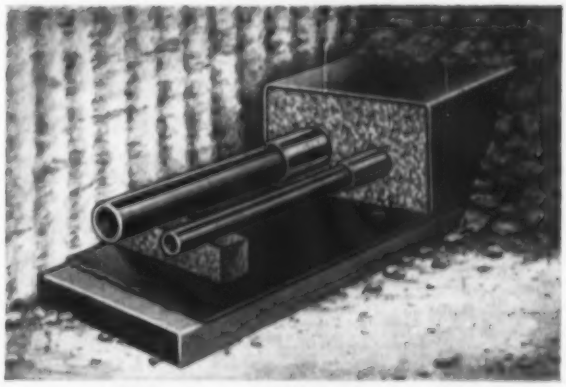

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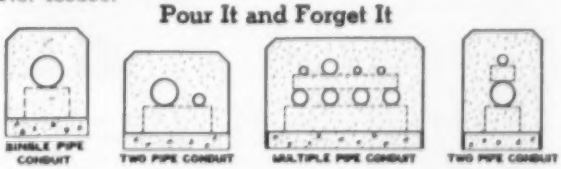

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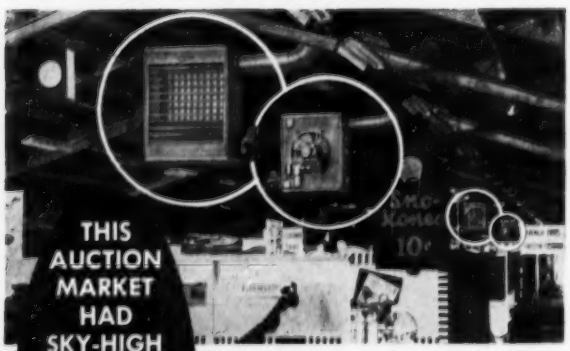

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NEW BOOKS & REPORTS

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STANDARD FOR WATER-COOLING TOWERS FOR USE WITH AIR-CONDITIONING AND REFRIGERATION EQUIPMENT—ARI standard 910-55. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C.

HISTORY OF INDUSTRIAL HYGIENE FOUNDATION—19 pp. Industrial Hygiene Foundation of America, Inc., Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. Free.

20TH ANNUAL MEETING, INDUSTRIAL HYGIENE FOUNDATION—Transactions bulletin No. 29. 279 pp. Industrial Hygiene Foundation of America, Inc., Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. $5.00.

ESSENTIALS IN PROBLEM SOLVING—Second Ed. By Zuce Kogan. Arco Publishing Co., Inc., 480 Lexington Ave., New York. $4.00.

PROCEEDINGS OF THE NATIONAL DISTRICT HEATING ASSOCIATION, 1954—175 pp. NDHA, 827 N. Euclid Ave., Pittsburgh 6. $10.00.

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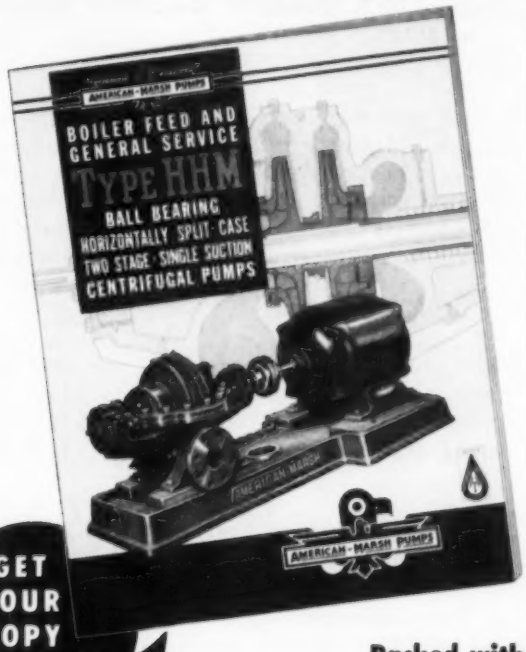

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Having *all* the facts will help you select the *best* pump for your needs. For pumps that look alike outside may vary greatly inside—in construction quality, suitability and dependability.

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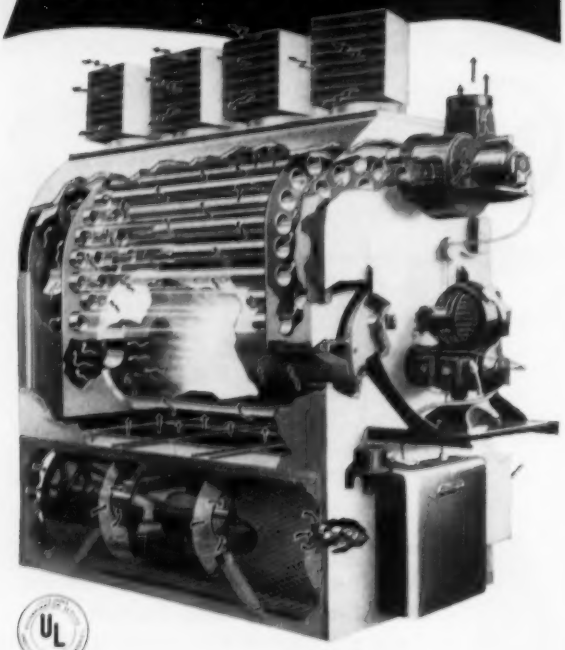

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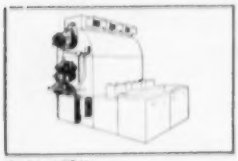

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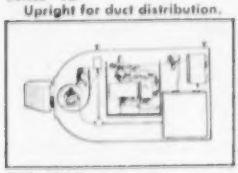

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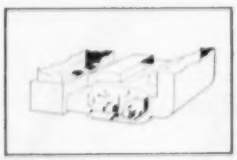

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NEW BOOKS & REPORTS

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FOUNDRY VENTILATION AND DUST CONTROL—Proceedings of British Cast Iron Research Association conference, 1955. 257 pp. From the association, Bordesley Hall, Alvechurch, Birmingham, England. About $10.00.

SELF CONTAINED AIR CONDITIONERS (Technical reprint No. 6), CLIMATIC DATA FOR DETERMINING THE NEED FOR COOLING EQUIPMENT (Technical reprint No. 9), PACKAGED TYPE BOILERS (Technical reprint No. 10)—Federal Construction Council reports. Available from Building Research Institute, 2101 Constitution Ave., Washington 25, D. C. $1.00 ea.

DEVELOPMENT OF BRAZING ALLOYS FOR HEAT RESISTANT ALLOYS—F. M. Miller and others. 73 pp. Report PB 121001 from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $2.00.

TEN YEAR INDEX TO CORROSION, 1945-54—Compiled by Norman E. Hammer and J. F. Van der Henst, Jr. 32 pp. Publication No. 56-10, National Association of Corrosion Engineers, 1061 M & M Bldg., Houston 2. $7.50. ($5.00 to NACE members.)

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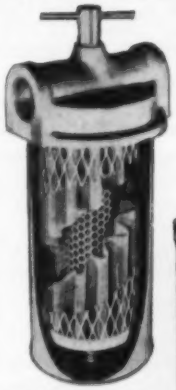

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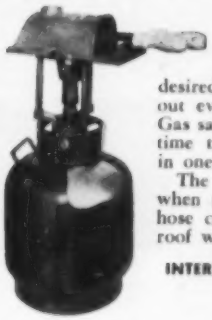

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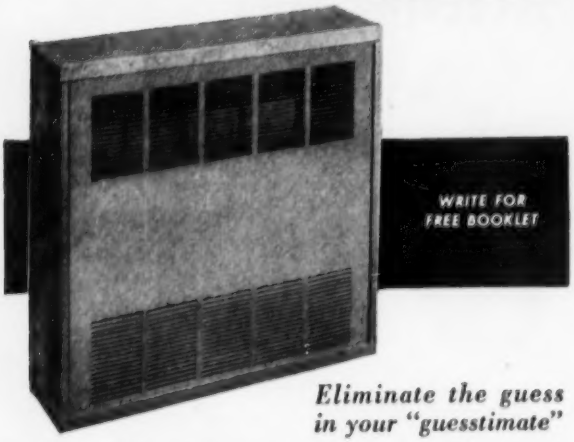

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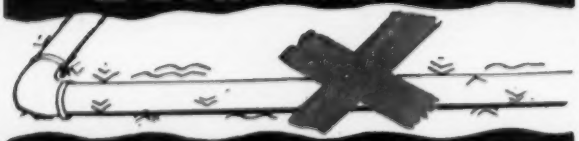

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HEAT TRANSFER AND FLUID MECHANICS INSTITUTE —Preprints of papers, 1956 Ed. 278 pp. Stanford University Press, Stanford, Calif. $5.75.

NINTH INTERNATIONAL CONGRESS OF REFRIGERATION —Proceedings. 1800 pp. The committee of the Ninth International Congress of Refrigeration., 177, Malesherbes boulevard, Paris (17e).

INCINERATOR DESIGN STANDARDS—7 pp. Bulletin S from Incinerator Institute of America, 420 Lexington Ave., New York 17.

1956 COLLECTED TECHNICAL PAPERS of the American Society of Tool Engineers. 524 pp. American Society of Tool Engineers, Technical Papers, 10700 Puritan Avenue, Detroit 38. Members, $4.00; nonmembers, $7.50.

I=B=R GUIDE C-30, a step-by-step procedure for calculation of cooling loads—Institute of Boiler and Radiator Manufacturers, 608 Fifth Avenue, New York 20. Guide, $1.00, 50 calculation sheets, $1.25.

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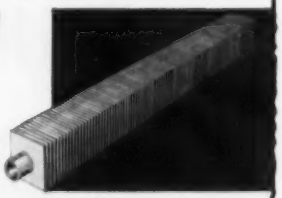

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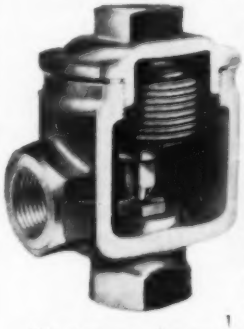

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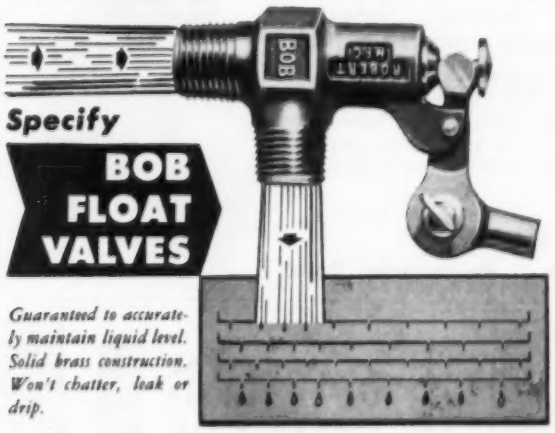

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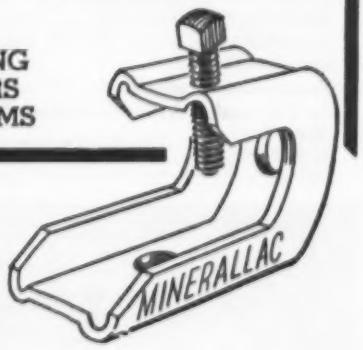

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SAFETY MANAGEMENT—by Rollin H. Simonds and John V. Grimaldi. 568 pp. Richard D. Irwin, Inc., Homewood, Ill. $7.80.

AMERICAN ARCHITECTS' DIRECTORY, a biographical directory of U.S. Architects. 748 pp. R. R. Bowker Company, 62 W. 45th Street, New York 36. $20.00.

STANDARD CLASSIFICATION AND TERMINOLOGY FOR POWER ACTUATED VALVES—12 pp. Fluid Controls Institute, Box 191, Decatur, Ill.

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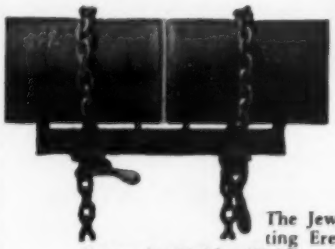

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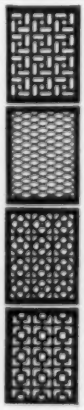

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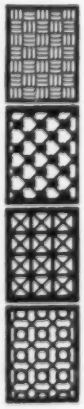

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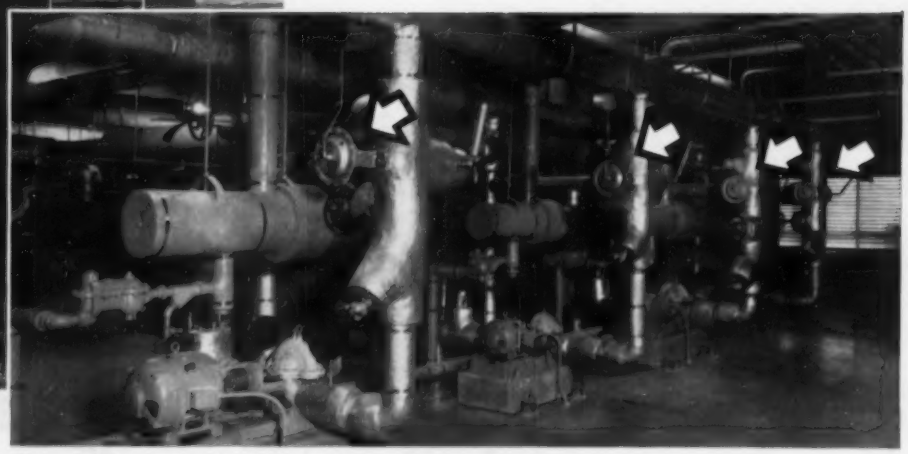

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